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The Veterinary Record

PATRON: HER MAJESTY THE QUEEN

Vol. 70 No. 18 Issue No. 4178 369-392

May 3rd 1958

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No. 18 MAY 3rd, 1958 Vol. 70

Registered for Transmission as a Newspaper *Price 2s. post free*

The Future of the Veterinary Profession*

BY

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I HAVE often been asked to forecast the more immediate future of veterinary students, but this is the first occasion on which my prophetic powers have been requisitioned in a wider field. There is, however, a notable difference in the nature of the two prophesies, the one is fateful, and according to some standards, at least, is as it ought to be; the other is fictitious and is unconnected with any standards as to what is desirable. I hope no one will think that any of my light-hearted and uninhibited prophesies are expressions of wishful thinking about the future of the veterinary profession, but only what present circumstances suggest that it might be.

This account is divided into two sections; first a brief general part dealing with present prospects, covering the span of life of everyone present in veterinary schools to-day, and secondly, the main part, in which it is proposed to follow up a few of the trends that are obvious to us now, coupled with the reading of one or two brief extracts from some future writings.

The essentially fictitious nature of the subject presents unusual difficulties. On account of the complete lack of restriction one can say just anything and dream aloud of what there is over the hills and far away. Looking backwards into the blue distance W. H. Hudson wrote of some of the more strikingly beautiful birds "their strangeness and loveliness bring to our imagination a dream and a picture of that unknown world, immeasurably far remote, where man was not"; and the same romantic haze covers the distant future, inviting us to think of desirable things. We veterinarians, however, are prosaic scientific people, we do not confuse probabilities with desires, so we shall stop short of that time, regrettably far away, at which the student of veterinary science is to enjoy the Garden of Eden (as he feels in his bones that he was intended to do now), and the process of learning has become merely a period of a few days or weeks of anaesthesia during which his responses are conditioned for a lucrative post in the veterinary field.

Part I—Present Prospects

Veterinary science is booming at the present time and the fortunate student has many reasons for feeling pleased with his choice of occupation. The period of expansion in the veterinary field still continues long after the time at which some of the wisest of our leaders had seen the onset of depression. No doubt the general prosperity due to rapid recovery following the war has had something to do with this; but there are other and more permanent reasons, concerning governmental recognition of the great losses brought about by disease and the effectiveness of veterinary intervention in their control or eradication.

Veterinary practice is still the most popular branch of the work and the best paid; but it is not on that point alone that its popularity depends; in my opinion it is the natural outcome of the generally accepted idea of the veterinary surgeon as a free and independent person who moves about in the open air, heals farm animals, and carries authority wherever he goes. It is this popular idea that selects the type of boy while still at school and it is only natural that most of those who graduate should want to carry on with what they had originally intended to do.

* Presented at the 1958 Conference of the Association of Veterinary Students held at Bristol from January 24th to 26th.

Popular ideas are slow to change and another generation or two may pass before boys leaving school will enter the veterinary profession because they wish to take up scientific work. On this account we may expect to see clinical work as the most popular line for some years to come.

A newer line of present development concerns increased activity in the employment of new and effective drugs and along with it the demand for veterinarians to fill posts connected with this development, either in research and investigational work in the pharmacological assay of the new drugs, or liaison posts between the manufacturers and the profession. At one time it was fashionable to frown on these posts and thought to be unfortunate whenever a promising graduate went to the manufacturing chemists, but this must now be regarded as important work and if we veterinarians are to maintain our rightful place in the rapidly expanding use of drugs for the control of animal disease we ought to be glad to have some of our better graduates occupying the posts that are offered in this field. This development is more apparent in the United States where many of the best workers are employed by big commercial concerns who pay them very well.

The Colonial Service should receive a passing mention at this point as a rapidly diminishing line of employment the place of which may, however, ultimately be taken by FAO and WHO which may perhaps develop into permanent international services for the purpose of helping to increase the agricultural productivity of the world.

Finally there is the general field of research, which is one of the most active and most rapidly developing at the present time. In the past few years research workers in general have taken on a new look. It is no longer considered necessary that they should be long-haired, pale-faced, and large-headed: they walk about like ordinary members of the community and most of them live quite ordinary lives working more or less by the clock, taking occasional holidays, and giving the usual attention to wives and children. This has now become a "job," one in which an ever-increasing group of workers is employed in the veterinary field, and in recent years it has not been found possible to fill all of the available posts. The meaning of an "expanding field of research" with regard to personnel is not widely understood. In my experience, however, if a capable investigator takes up a research problem in disease he is almost sure, within a period of 5 years, to strike some side-line that in his opinion would be very well worth following—it might pay good dividends. If his request for this assistance is met, and the new worker is a good one, he again within 5 years will strike another promising side-line. It may be remembered how, given favourable conditions, some bacteria can be shown to divide every half hour into 1, 2, 4, 8, 16, and 32 at the end of three hours, and how, continuing at that same rate there are some 16,000,000 in 12 hours. That is the kind of way in which research jobs could multiply at the present time if only money and personnel were available.

It is now recognised by those who handle the nation's finances that the nation should do as much research as its exchequer can afford and there is no doubt that increasing activity in this field will continue, for which better pay will ultimately be forthcoming as the need for attracting the best brains becomes more fully recognised—the leading academicians are the aristocrats of the future.

It may be concluded, therefore, that there will be plenty of employment in the near future and that veterinary students of to-day may congratulate themselves on the prospects.

Part II—Future Prospects

The matter of looking further ahead, into the more distant future is a kind of guess work that has appealed to the romantic natures of several writers dating back to Jules Verne who may be regarded as the inventor of a kind of fiction based on the exaggeration of scientific advance. Although the scientific method has enabled man to change the flora and fauna of the earth as nothing has done throughout the previous 400,000,000 years his mentality is of a simian nature and there is a marked tendency to exaggerate its powers. Just as he is one of the vertebrates in his physiology, so is he one with the same group in his psychology. It is true that his intelligence is developed to a greater extent, but it is his emotions and not his intelligence that drive him on to do things, and as far as one can see his emotions are in no way different from those of his fellow mammals. Some day perhaps man's intelligence will gain the ascendancy over man's emotions but that happy day is not yet in sight.

The poets are apt to write carelessly of "flights of imagination," but anyone who seriously sets out to look into the future finds this glow-worm imagination of ours to be very inadequate in lighting the path ahead. The approach that I have chosen is the rather prosaic one of picking out a few obvious trends that can be seen at the present time and endeavouring to follow them a little further into the gloom of the immediate future and the blackness beyond. In our scientific work we are frequently able to recognise underlying principles to which a group of reactions seem to conform and these principles we are able to use in our investigations, often to great advantage. In my forecast I have endeavoured to follow the same method, and for the more purely fictitious part, dealing with the distant future, employ a method of presentation that I hope may help me to avoid apparent responsibility.

I am fortunate in having at my home a rather nicely appointed workshop, fitted with a few machine tools and apparatus for precise measurement where, in imagination, I fashioned a "Time Machine" of an entirely new design, so compact that I was able to carry it unobserved into the British Museum, where I found the writings of a veterinary historian of the year A.D. 2500—one Patrick McKay Jones. Unhappily it was much less helpful than I had at first expected; for one thing it was extremely difficult to read, as many of the terms were entirely new so

that whole sections were quite beyond my understanding. There were, however, certain passages that can be of interest to us to-day and I propose here and there to quote a few extracts that may perhaps reveal something of the future work of our profession.

I. Centralisation

This tendency has been in evidence throughout the growth of civilisation. Arrow-heads and bones, and latterly, scraps of paper, have enabled us to piece together a picture of isolated families living in holes in the ground as the beginning, these families tending to group together for mutual help and mutual protection. Tens of thousands of years pass and the families become centralised in a village under a head man; later on, villages group together under central leadership; these communities group to form tribes, tribes to form nations. We now see very large groups of nations, and unless something happens that is quite new we shall ultimately see the whole world of mankind organised from one central government.

These same forces are seen to be in operation among the specialised groups within the whole mixed community. The organisation of the guilds and later of the trade unions is a good example; the centralisation of veterinary services--field staff, research, advisory, investigational, and municipal staffs under one head—is another.

As part of this same tendency we see the formation of groups of veterinary practitioners working with greater ease and efficiency because of centralisation. If we now follow the trend a little further, without making any reference to McKay Jones, we must see a centralised veterinary service under the central government, and we may suppose, since in this country changes come about by evolution rather than by revolution, that the R.C.V.S. will become a government body through which all the veterinary services will be organised including meat inspection, inspection under the Vivisection Act, work in the health aspects of animal husbandry, and, ultimately, private veterinary practice.

Perhaps we might turn for a moment from the veterinary profession itself to the work that it will be doing and mention the work of the complete eradication of infectious disease. This will be among the early endeavours of the National Veterinary Service, and the first group of organisms to disappear will be the essential pathogens. Already the Government Service has done good work in this direction; numbers of infectious diseases have disappeared from the country and the causal organisms have been eradicated. Tuberculosis will undoubtedly be the next disease to come under control although it may be a long time before the last organism is killed--probably only after the discovery of some bactericidal substance of outstanding activity against acid-fast organisms. The peak period of the testing of cattle in which we are moving at the present time will continue for another 6 or 8 years after which the work will be less pressing. Check testing at increasing intervals will continue for some years with occasional series of tests at shorter intervals on farms or in localities where the infection is found still to have a foothold—as is done in America at the present time. As yet complete eradication is not in sight even there where the task began some 30 years ago.

Still without making reference to McKay Jones we may see brucellosis as the next disease on which to make an organised attack, methods of diagnosis and of protection presenting the problem as a very practical one: it seems that we have the means now, and all that we need is the opportunity, which will be ours as soon as the tuberculosis problem is settled. After brucellosis it may be swine fever—again we seem to have the means, but the next one on the list of pathogens that are essential parasites, Johne's disease, seems at present a more difficult problem—perhaps once again we must wait for the new substance with outstanding activity against acid-fast organisms.

It is not easy to see what will happen after that, but here I would like to quote two interesting passages in Patrick McKay Jones's history to which I have referred, from his book published in the year A.D. 2500.

First, one about the eradication of infectious disease. Jones states:—

"The task of the eradication of the pathogenic organisms that lived an exclusively parasitic life was facilitated in its later stages by the growing increase in the artificiality of the farming of animals and birds. The rapid development of intensive methods brought the environment under complete control and thereby eliminated the wholely parasitic organisms. The facultative parasites proved a much more difficult group, but the worst troubles arose through the very means themselves that had been employed in bringing about control. Antibiotic substances were used in increasingly large amounts and ever-increasing variety ultimately bringing about such extensive changes in the internal bacterial flora of the intestines of the animals, and in the external bacterial flora of the environment of the animals that the balance of the ecological unit was entirely disrupted and many organisms that had never previously been associated with disease now frequently proved pathogenic. It had not been realised that vertebrate species can only survive alone under the most rigid experimental conditions and that the normal animals that have evolved to populate the earth are in reality communities of living things. This derangement of community life through the use of antibiotics was for a time a source of much work for the veterinarians whose responsibility it became to collect the proper samples of intestinal and environmental bacterial flora, and arrange for their examination and their readjustment by means of bacterial starters added to the ailments and sprayed onto the environment.

"At the present dairy centre at Gloucester, where there are some 75 miles of cow coops there are only 80 resident members of the veterinary staff, one officer per mile of coops. Much of the inspection, examination, and administration of medicaments is now automatic, through means of various electronic devices, and the 3,170 miles of tubing installed in the building. Records are stored on micro-film in the cow library whither they are automatically transmitted and incorporated into the national filing system. The new racks for decerebrate cows recently constructed at Wolverhampton will require even less veterinary attention."

A second interesting extract, making specific reference to research, is quoted here on account of its very pertinent bearing on some aspects of the development of veterinary research. Jones writes, A.D. 2500:—

"It had taken a very long time for the germination of the idea that there is a fundamental staleness associated with large groups, and that where direction comes from

some inaccessibly remote altitude in the hierarchy of administration there is a marked loss of incentive and a tendency for artistic creativeness and scientific inventiveness to be discouraged in the general dissolution of individuality. There is every reason for supposing that the fundamental characteristics of human nature are precisely the same as they were 10,000 or 100,000 years ago, back to the savage times at which small groups of the earlier representatives of *Homo sapiens* competed with one another for supremacy.

"We may suppose that the beginnings of the trend for centralisation went on for hundreds of thousands of years during which time there was often a desperate necessity for cohesion within the family groups, for a recognition of responsibility, and of loyalty to the chief. This social complex of ideas, now called the "team spirit," must have been among the most powerful forces in selection for survival among those early small groups wherein organisation appeared as a natural quality. The psychological forces underlying this "team spirit" of ours are therefore very deeply rooted in human nature as it survives at the present time. To exclude personal contact with the leader of the group is to exclude the natural response to leadership and to lose the stimulus to individual development, with its accompanying expression in artistry and invention which is at the very root of our urge for scientific discovery.

"Such inborn qualities readily respond to encouragement from suitable surroundings but tend to sleep in the absence of the appropriate stimulation. In the year 2100 this force had been so far recognised that research was no longer attempted in large institutes; it had been shown that the isolation of departments within large institutes is ineffective in this respect, so that despite decreased efficiency in the use of accommodation and equipment the output of research per unit of expenditure is greatly enhanced by limiting the number of professional workers in any one centre to eight. In such an environment the natural cohesion that kept the tribe together 10,000 years ago and urged the individuals along to increased activity comes into play to the benefit of scientific advancement."

II. Mechanisation

This term is used to cover the trend that set in with the industrial revolution for machines to take on to an increasing extent the work of man. The process still continues unabated; the horse is no longer necessary and has been added to the numbers of living creatures that are kept for pleasure only. Recently we have begun to hear of a kind of hyper-mechanisation called "automation" and the manual work of man will be called for less and less. This is all leading towards shorter hours and the clear indications are that the average man of the future will have much more leisure. What will he do with it, and how will it affect the veterinarian?

We may suppose that increasing efforts will be made to educate people for the increased appreciation of the arts. This endeavour is, however, likely to meet only with a partial success, academic inclination is an inborn character and is comparatively rare so that the great majority are still likely to spend their leisure in amusements of an increasingly artificial kind, or in improved facilities for sport: there will, however, be quite a proportion who have the inborn desire to breed or rear or train some form of animal or bird and will devote much of their ample leisure time to the pursuit of that pleasure. There is something fundamental about this love of animals, harking back to the time when man was a hunter—a period that lasted for hundreds of thousands of years—on which account the pleasurable responses are likely to last for a long time and to give an unending satisfaction to those who give them play. It may be supposed, therefore, that there will be an increasing call for knowledge of disease, not only in horses, dogs, and cats, but also in an ever-increasing list of birds and animals that will help the leisured human worker of the future to enjoy the earth. This branch of clinical work is growing at the present time and we should encourage it.

We may even imagine a time when this is the only section of work in the veterinary field still open to private practice, although even here the greater part of the work may be done by large combines heavily subsidised by the Government, with separate institutes for the study of diseases of canine, feline, and rodent animals and of passerine, columbine, and psittacine birds, with occasional special branches for the diseases of mice, canaries, reptiles, and fishes.

I found one paragraph in Jones's writings that might be of some interest at this point; he writes, of the year somewhere about A.D. 2100:—

"At about this time the breeding of birds for special colours and markings had reached a standard of certainty undreamed of by the early geneticists. Electronic forecasters were introduced, the earlier models requiring the male and the female parents of mixed genetical constitution to be placed in small compartments at opposite ends of the apparatus and left there for a period of 5 minutes. The electronic calculators were then set in motion and the genetical potentialities of the cross delivered on cards within 24 hours. Such devices were very effective in catching the interest of numbers of people who otherwise would not have taken to the fancy, and as a result there was a great increase in the pet population, with a consequent demand for veterinary advice and an enlargement of the Private Practice branch of the National Veterinary Service."

III. Specialisation

This is everywhere apparent; knowledge grows progressively but our brains remain of the same small size. Lin Yutang wrote of the brain of man as not intended for science, it was intended, as he put it, picturesquely, "for sniffing food"; he agreed, however, that if at the same time it could also "sniff" a mathematical problem that was all to the good, but it was not its original function, and we must not expect it to work miracles. You will remember the old phrase quoted by Darwin, "*Natura non facit saltum*," which in his sphere of interest applied to the gradual succession of physical developments. It is none the less true in the psychological field; as has already been observed, man's mentality is of a simian nature, it has not leapt away but only evolved from the monkey and it is still not so very far removed.

Our present way out of the difficulty is to divide this too great pile of tradition into a thousand different specialisations. May I borrow an idea (without being charged with plagiarism) and liken knowledge to a tree, and the student to an ant who painfully climbs the trunk, a part along which all students must travel. Somewhere at the top of the trunk is a division into great boughs where the veterinary student chooses the biological sciences rather than the physical, the several branches of the arts having been passed by already. Still further along he chooses the branch of the knowledge of disease, and later on, the veterinary branch instead of the medical one.

He can then go either along the clinical branch or the laboratory branch, and if so chance that he is to be a parasitologist he comes to successive dichotomous branching away from the bacteria and then away from the fungi. A little further along he may pass the branch that leads to the knowledge of protozoa and take the helminth branch which further subdivides. Of the three branches available we may suppose he takes the one for the nematodes; but if he is going to be a real expert he must now choose one of numerous branches, for the nematodes number their species in thousands and it is possible to know only a few. Travassos's monograph on the trichostrongylidae alone is a work of over 800 pages long. See how little, therefore, one can know even in 1958, and imagine the long, continued process of dichotomous branching ahead. I am again tempted to recall the dividing bacteria and the 16,000,000 in 12 hours!

The American Chemical Society is considering the publication of its Fifth Decennial Index to *Chemical Abstracts* for the years 1947 to 1956 and has recently sent a letter to subscribers from which the following is extracted: "So vast has been the expansion of chemistry in the past 10 years that merely to index the literature will require 21,500 large, fine-print pages, equivalent to more than 80,000 text-book pages. Production costs of the work will approach the fantastic sum of $2,000,000." It is further stated that the work will include some 647,000 references compiled from 6,000,000 index cards, requiring 150 tons of type metal, and 50,000 man hours for the setting of the type from which 12 miles of galley proof will be struck. Yet this is chemistry alone! How truly it is said that the specialist comes to know more and more about less and less and the man in the street less and less about more and more, and this in a world where science has only just begun!

What will be the outcome? How are we going to manage the mass of literature, added to by ever-increasing yearly publication? I imagine the electronic computers will be made to serve a useful purpose and it may be that for a time at least, all authors will be required to complete a series of detailed and complicated cards giving an orderly account of their findings, the first cards serving to place the work among the branches of the tree of knowledge, and later ones among the little twigs.

The following short passage is taken from Jones's history. It seems understandable enough to us even now, in spite of the intervening years, and indicates the kind of thing that is likely to happen:—

> ". . . apart from the regions of historical records there is now an understanding among scientific workers to overlook all publications that are more than ten years old. After that time the work which has been added to the tradition of each specialisation is only available on the co-ordinated microfilms and is no longer recognised as separate work. On account of the pooling of knowledge the old-time competition for priority and the popular acclaim has entirely disappeared and men pay attention to advance as registered by the general rise in the cultural level rather than through the research strivings of the few."

A paragraph from another part of the book refers to the grading of specialists, the need for which we have not yet openly recognised. Jones states:—

> "Some 300 years have now passed since the grading of specialisation began, a classification which in itself now employs many thousands of scientific workers and organisers. In the first place there was a rough subdivision into 'specialists' who knew one field of work and 'generalists' who kept themselves informed, to a lesser degree, in a number of closely related fields; they understood the relationships of different specialisations. Following this lead there was a further subdivision into 'sub-generalists' and 'hyper-specialists' then we had 'super-generalists' and 'hypo-specialists' until at the present time we have the well-known 25 grades."

IV. Increase in World Population

Those who like to turn up the figures concerning world population will be shocked at the rate of present addition to the numbers of people on the earth. Now that the major killing diseases have been brought under control, that the state of war as a normal occurrence between primitive peoples has been stopped, and ease of transport and assistance from afar has curtailed the losses from famine, the major checks on population increase have been removed and it goes on at an alarming rate. Under our civilisation rational control takes the place of the ecological forces of competition for survival in a world of living things that are reproducing themselves very greatly in excess of requirement. The ultimate outcome will presumably be the maintenance of a more or less stable human population in the region of the maximum number that the earth will support, that is to say, at a number greatly in excess of population at the present time.

Before that doubtfully happy state comes about it seems not unlikely that we must go through periods at least of threatened shortage, and that in an endeavour to meet the demand for increased room and increased food we shall have to make the earth much more productive than it is. The intensive rearing of stock is a trend that can already be seen, particularly among poultry and pigs. It is interesting, however, that the main reason behind this development is the control of the diseases caused by the parasitic organisms that are readily transmitted from one bird or animal to another, out in the open field. In essence it begins as an adaptation of hygiene whereby the disposal of effete material can be brought under control; its ultimate aim, however, will be to increase animal products for human consumption. The trend is seen most clearly in the rearing of poultry for the production of eggs and birds for the table, the best example being in the American broiler industry an account of which reads like some of the extracts that I have reproduced from Jones's history. In 1956 1,200,000,000 birds were produced in intensive houses, some of which are large and are mechanised to a fantastic degree. It is reported that at one of the largest establishments there are 18 houses, each 620 feet long by 48 feet wide, and each holding 40,000 birds, which for ordinary day-to-day feeding are looked after by only one man.

Not only has there been a great development in the mechanisation, but also in the specialised

(*Concluded at foot of cols.* 1 & 2 *overleaf*)

Avian Salmonellosis in England and Wales 1948-56, with Comment on its Prevention and Control

BY
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SUMMARY.—1. *The first part of this paper contains a series of tables and graphs illustrating the incidence and distribution, according to species of bird involved, of Salmonella infections as encountered in the routine* post-mortem *section of the Poultry Department at Weybridge during the years* 1948-56.

These figures are based on the bacteriological examination of 18,422 *batches of chicks, turkey poults, ducklings, and goslings.*

S. pullorum *was isolated from* 8.38 *per cent. of the chick batches,* S. typhi-murium *from* 3.2 *per cent., and* S. thompson *from* 1.5 *per cent.; the incidence of the less common infections was relatively insignificant.*

During the period under review, two hitherto unrecorded Salmonella serotypes were isolated: S. new haw (0 = 3, 15; *H* = *eh*: 1, 5) *from* 2 *batches of turkey poults, and* S. weybridge (0 = 3, 10; *H* = *d* : z_6) *from* 2 *of* 4 *ducklings.*

2. *The second part of the paper is a brief account of the control and prevention of pullorum disease, fowl typhoid, and the more common motile Salmonella infections as encountered in England and Wales. Particular reference is made to the use of a stained typhi-murium antigen in rapid whole-blood agglutination tests.*

IN 1946, Gordon and Buxton published a survey of the incidence of Salmonella infections in poultry in Great Britain covering the years 1933-44. This survey was based on the records of *post-mortem* examinations carried out on specimens received in the poultry department of the Veterinary Laboratory, Weybridge, from all parts of England and Wales except for the 5 northern counties. In view of the wide area covered by this laboratory, these authors considered that the data produced was a reasonable index of the occurrence and relative incidence of avian salmonellosis in this country. Eleven years have now passed since the publication of this work and it was therefore decided to review the position once again, covering the period since the last survey except for a 3-year interval.

The Future of the Veterinary Profession—*Concluded.*

handling of rations and in the breeding of the birds. The producers do not rear their own stock but purchase them from a specialised breeding industry within which there is a further subdivision into breeders who produce only males for sale (and sell no females) and breeders who sell only females.

These are only beginnings. Poultry have been driven indoors by disease and the absolute necessity that hygiene should be under control in a way that it never can be in the fields. Pig keeping is following the same course; and grazing animals are likely to go the same way in the course of time. Helminthic disease will disappear but there will be a lot to learn and a lot to do in coping with a new list of disturbances to health associated with the new artificialities.

This trend of increasing population is likely to be the driving force behind our scientific invention for several generations to come; the ultimate adaptations are likely to be extreme, for which reason I was able to glean comparatively little from Jones's history, his account being being increasingly obscure in the latter part of the book. In several passages I had noticed mentions of the Philippinos; it was not until I found the following passage, however, that I began to understand the important part they were beginning to play at the time of the Jones's writings. I have read, even in our present literature of the outstanding intelligence of these people, a point borne out in every way by my own slight personal acquaintance and it may be in part on that account that I was unusually pleased to find the following passage. Jones states:—

"It was about the year 2290 that the religious scientific revolution occurred in the Philippine islands as a result of which the whole nation embraced the worship of the new god Schi* and accepted the teaching of science as the guiding principle for the happiness of man. Through the fanatical devotion of the populace a time soon arrived when the high priests were able to introduce the practice of foster-pregnancy as one of the tenets of the religion; consequently it became wicked to produce children except through implantation of ova already fertilised, both donors being of the best of the nation. As a result of this step the Philippinos rapidly became so superior in physique and intellect that they were freely acknowledged as such by all the races of the world.

"In spite of the undeniable evidence of its power for good the introduction of Schi worship was resisted by other countries until some 50 years ago when Philippino missionaries began to make a number of converts in China where the religion is now rapidly spreading."

The veterinary student of to-day, however, need not worry unduly about this future substitution of scientific procedures for natural occurrences. If we are to believe Patrick McKay Jones it is not likely to happen for another 500 years.

* A footnote in Jones's history states: "Although the spelling would suggest otherwise, and the word is pronounced 'sky' there can be no doubt as to its derivation—an adjustment to prejudices still running."

The present paper is divided into two parts: the first concerns the incidence and distribution of Salmonella infections in recent years and the second is a short account of the control and prevention of these diseases, with special reference to the use of a stained *Salmonella typhi-murium* antigen as a whole-blood agglutination test.

Part 1

Bacteriological Technique

The routine techniques used at Weybridge in this work were described in detail by Gordon and Buxton (1946). The only significant change has been the introduction in recent years of routine testing of all cultures of *S. pullorum* and *S. gallinarum* for evidence of form variation (Blaxland, Sojka & Smither, 1956). Most of the sera used for the serological typing were supplied by the Standards Laboratory, Colindale. All the cultures were typed at Weybridge with the exception of new serotypes, which were forwarded to the Salmonella Reference Laboratory, Colindale, after initial attempts to establish their identity had failed. The Reference Laboratory also confirmed the typing of certain of the more uncommon species encountered at Weybridge.

Incidence and Distribution of Salmonella Infections, 1948-56

The annual incidence of these diseases in specimens received for *post-mortem* examination at Weybridge is shown on the accompanying series of graphs (Fig. 1).

The majority of outbreaks occurred in baby chicks; for the purpose of these records a chick is a young bird from day-old to 4 weeks of age and the term includes baby chicks, turkey poults, ducklings, goslings, and pheasant chicks. The figures on which the graphs are based are the number of infected batches of chicks. It is rare to receive more than one batch of specimens from each outbreak, but occasionally several outbreaks of the same infection are encountered all traceable to a single farm or hatchery.

Table I gives a list of all the Salmonella organisms isolated from poultry at Weybridge during the years under review, together with the distribution of the serotypes in different species of bird. Chicks, poults, etc., are recorded as batches but the adults (including young birds over 4 weeks of age) are counted as individuals.

Table II shows the distribution of the serotypes over the 8-year period in respect of chicks of all species and Table III in respect of adult birds. The figures obtained of Salmonella infections in adult birds are of epidemiological interest only as bacteriological examination is not practicable or necessary on every individual carcase received for routine *post-mortem* examination.

FIG. 1.—SALMONELLA OUTBREAKS 1948 - 1956.

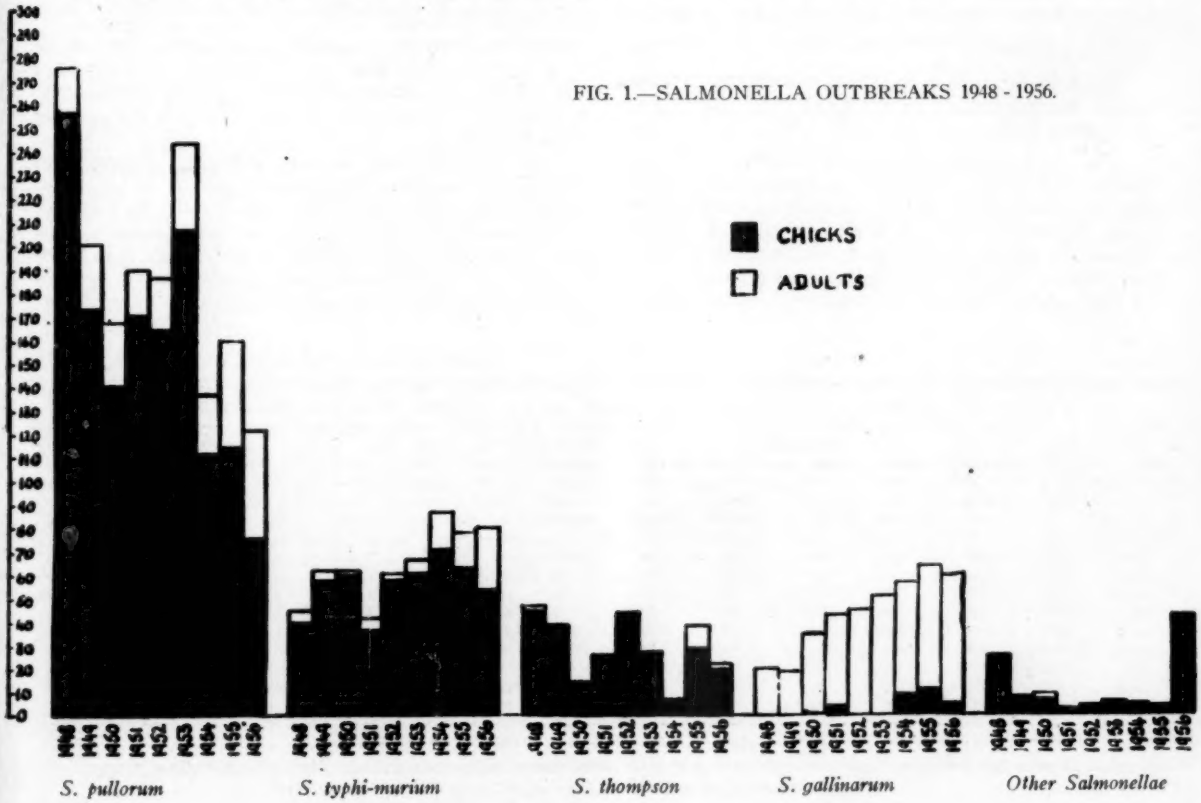

TABLE I

SALMONELLA SURVEY, 1948–56. SALMONELLA ISOLATIONS IN THE POULTRY DEPARTMENT, WEYBRIDGE

		Chicks	Adult fowls	Turkey poults	Adult turkeys	Ducklings	Adult ducks	Goslings	Adult Geese	Pigeons
1.	*S. pullorum* ...	1,543	373	1	—	—	—	—	—	—
2.	*S. gallinarum* ...	34	463	2	1	—	—	—	—	—
3.	*S. typhi-murium* ...	382	68	101	22	86	11	10	1	5
4.	*S. thompson* ...	250	14	17	1	12	—	—	—	—
5.	*S. stanleyville* ...	4	—	22	—	1	—	—	—	—
6.	*S. anatum* ...	10	—	6	—	6	—	—	—	—
7.	*S. enteritidis* ...	4	3	1	—	4	1	1	1	—
8.	*S. worthington* ...	7	—	—	—	1	—	—	—	—
9.	*S. concord* ...	6	—	—	—	—	—	—	—	—
10.	*S. derby*	2	—	2	—	—	—	—	—	—
11.	*S. meleagridis* ...	1	—	1	—	2	—	—	—	—
12.	*S. montevideo* ...	1	—	2	—	—	—	—	—	—
13.	*S. give*	—	—	—	—	2	—	—	—	—
14.	*S. oranienburg* ...	—	—	2	—	—	—	—	—	—
15.	*S. new haw* ...	—	—	2	—	—	—	—	—	—
16.	*S. bareilly* ...	—	—	1	—	—	—	—	—	—
17.	*S. bovis morbificans*	1	—	—	—	—	—	—	—	—
18.	*S. chester*	1	—	—	—	—	—	—	—	—
19.	*S. chicago*	1	—	—	—	—	—	—	—	—
20.	*S. duesseldorf* ...	1	—	—	—	—	—	—	—	—
21.	*S. infantis* ...	—	—	—	—	—	—	—	—	—
22.	*S. kentucky* ...	1	—	—	—	—	—	—	—	—
23.	*S. livingstone* ...	1	—	—	—	—	—	—	—	—
24.	*S. london*	—	—	1	—	—	—	—	—	—
25.	*S. mbandaka* ...	—	—	1	—	—	—	—	—	—
26.	*S. senftenberg* ...	—	—	1	—	—	—	—	—	—
27.	*S. weybridge* ...	—	—	—	—	1	—	—	—	—
28.	Salmonellae untyped	12	—	3	—	1	—	1	—	—
	Total ...	2,262	921	166	24	116	12	12	2	5

(a) *S. pullorum*

Table II, in addition to details of serotypes isolated, gives the percentage incidence of pullorum disease in relation to the total number of batches of "chicks."

The considerable number of *S. pullorum* isolations from adult fowls (Table III) is accounted for by the fact that one of the duties of the Weybridge laboratory is the bacteriological examination of selected fowls reacting to the rapid blood test used to detect carriers of pullorum disease under the Poultry Stock Improvement Plan by the field staff of the Animal Health Division. Epidemic pullorum disease in adult fowls has not been diagnosed at Weybridge since the war years when swill was used extensively, some of it containing poultry offal, for the feeding of fowls.

It is interesting to note only one outbreak of pullorum disease among turkey poults and none at all in any other species of bird, despite the fact that all wild birds received for examination have been examined bacteriologically. It would seem that birds, with the exception of *Gallus domesticus*, have a natural resistance to this organism, although they

TABLE

SALMONELLA SURVEY, 1948–56. SALMONELLA OUTBREAKS DIAGNOSED

Year	Total number of batches	*S. pullorum*			*S. typhi-murium*			Salmonellae other than *S. pullorum* and *S. typhi-murium*													
		Number of infected batches	Number of outbreaks	Percentage infected of total batches	Number of infected batches	Number of outbreaks	Percentage infected of total batches	*S. thompson*		*S. gallinarum*		*S. anatum*		*S. bareilly*		*S. bovis morbificans*		*S. chester*		*S. chicago*		*S. concord*	
								I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.
1948	2,100	269	257	12·8	45	40	2·0	52	45	—	—	7	7	—	—	1	1	—	—	—	—	6	5
1949	1,664	193	174	11·6	65	58	3·3	38	38	—	—	2	2	—	—	—	—	—	—	—	—	—	—
1950	1,226	151	141	12·32	64	60	5·0	15	14	1	1	1	1	—	—	—	—	—	—	—	—	—	—
1951	1,824	180	171	9·87	41	37	2·3	33	26	—	—	1	1	—	—	—	—	—	—	—	—	—	—
1952	2,187	174	165	7·96	65	58	3·0	47	44	4	4	—	—	—	—	—	—	—	—	—	—	—	—
1953	2,475	228	207	9·27	72	61	2·9	30	27	—	—	1	1	—	—	—	—	—	—	1	1	—	—
1954	2,254	129	112	5·72	92	71	4·0	6	6	12	9	—	—	—	—	—	—	1	1	—	—	—	—
1955	2,366	139	115	5·87	77	63	3·3	36	29	14	11	—	—	—	—	—	—	—	—	—	—	—	—
1956	2,326	81	76	3·48	60	54	2·9	22	20	5	5	10	10	1	1	—	—	—	—	—	—	—	—
Total :	18,422*	1,544	1,418	8·38	581	502	3·2	279	249	36	30	22	22	1	1	1	1	1	1	1	1	6	5

* A rough estimate is three individual specimens to each batch, *i.e.* 52,266 examinations.

TABLE I—*continued*

	Other species							Total	Percentage of total isolations
	Pheasants	Budgerigars	Penguins	Guinea fowls	Parrot	Finches	Silver-eared mesia		
1. *S. pullorum* ...	—	—	—	—	—	—	—	1,917	54·0
2. *S. gallinarum* ...	—	—	—	—	—	—	—	500	14·0
3. *S. typhi-murium* ...	2	1	2	1	1	10	1	704	20·0
4. *S. thompson* ...	—	1	—	—	—	—	—	295	8·3
5. *S. stanleyville* ...	1	—	—	—	—	—	—	28	0·8
6. *S. anatum* ...	—	—	—	—	—	—	—	22	0·6
7. *S. enteritidis* ...	—	—	—	—	—	—	—	15	0·4
8. *S. worthington* ...	—	—	—	—	—	—	—	8	0·24
9. *S. concord* ...	—	—	—	—	—	—	—	6	0·18
10. *S. derby*	—	—	—	—	—	—	—	4	0·24
11. *S. meleagridis* ...	—	—	—	—	—	—	—	4	0·12
12. *S. montevideo* ...	—	—	—	—	—	—	—	3	0·09
13. *S. give*	—	—	—	—	—	—	—	2	0·06
14. *S. oranienburg* ...	—	—	—	—	—	—	—	2	0·06
15. *S. new haw* ...	—	—	—	—	—	—	—	2	0·06
16. *S. bareilly* ...	—	—	—	—	—	—	—	1	0·03
17. *S. bovis morbificans*	—	—	—	—	—	—	—	1	0·03
18. *S. chester*	—	—	—	—	—	—	—	1	0·03
19. *S. chicago*... ...	—	—	—	—	—	—	—	1	0·03
20. *S. duesseldorf* ...	—	—	—	—	—	—	—	1	0·03
21. *S. infantis* ...	1	—	—	—	—	—	—	1	0·03
22. *S. kentucky* ...	—	—	—	—	—	—	—	1	0·03
23. *S. livingstone* ...	—	—	—	—	—	—	—	1	0·03
24. *S. london*	—	—	—	—	—	—	—	1	0·03
25. *S. mbandaka* ...	—	—	—	—	—	—	—	1	0·03
26. *S. senftenberg* ...	—	—	—	—	—	—	—	1	0·03
27. *S. weybridge* ...	—	—	—	—	—	—	—	1	0·03
28. Salmonellae untyped	—	—	—	—	—	—	—	17	0·5
Total ...	4	2	2	1	1	10	1	3,541	100·01

Total number of batches of chicks (various species) examined at Weybridge during 1948–56 : 18,422.

appear to be susceptible to many other Salmonella serotypes.

The position among turkeys conforms with the fact that pullorum disease has not yet been detected in any of the adult turkey breeding flocks blood-tested every year since 1944 under the Poultry Stock Improvement Plan regulations. The apparent natural freedom from pullorum disease of turkeys in this country has already been commented upon (Blaxland, 1954) and this fortunate position continues in spite of considerable expansion of the turkey industry in Great Britain during the past few years.

(b) *S. gallinarum* (fowl typhoid)

The relatively small number of outbreaks of fowl typhoid diagnosed in chicks as opposed to adult fowls is consistent with the view that pullorum disease and fowl typhoid are epidemiologically two distinct diseases (Blaxland, Sojka & Smither, 1956). The increase in the number of fowl typhoid outbreaks

II

IN ROUTINE SPECIMENS. A.—CHICKS, ETC., OF ALL SPECIES

Salmonellae other than *S. pullorum* and *S. typhi-murium*																																			
S. derby		*S. duesseldorf*		*S. enteritidis*		*S. give*		*S. kentucky*		*S. livingstone*		*S. london*		*S. mbandaka*		*S. meleagridis*		*S. montevideo*		*S. new haw*		*S. oranienburg*		*S. infantis*		*S. senftenberg*		*S. stanleyville*		*S. weybridge*		*S. worthington*		Salmonellae untyped	
I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.
1	1	—	—	5	5	—	—	1	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
—	—	1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	3	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	4	—	—
—	—	—	—	—	—	2	2	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—
1	1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	3	3	—	—	—	—	—	—
2	1	—	—	1	1	—	—	—	—	1	1	1	1	—	—	3	2	2	1	2	2	2	2	1	1	1	1	25	15	—	—	2	2	2	2
4	3	1	1	10	10	2	2	1	1	1	1	1	1	1	1	4	3	3	2	2	2	2	2	1	1	1	1	28	18	1	1	8	6	17	17

I. = Infected batches. O. = Outbreaks.

TABLE III

SALMONELLA SURVEY, 1948–56. SALMONELLA OUTBREAKS DIAGNOSED IN ROUTINE SPECIMENS. B.—ADULTS OF ALL SPECIES

Year	*S. gallinarum*		*S. pullorum*		Salmonellae other than *S. gallinarum* and *pullorum*						Total		Total number examined*
					S. typhi-murium		*S. thompson*		*S. enteritidis*				
	Number of isolations	Number of outbreaks	I.	O.	I.	O.	I.	O.	I.	O.	I.	O.	
1948	22	20	23	19	6	5	2	2	1	1	54	47	6,266
1949	20	19	34	27	4	4	1	1	—	—	59	51	6,987
1950	37	34	32	27	2	2	—	—	2	2	73	65	7,399
1951	63	39	25	19	6	5	—	—	2	2	96	65	6,803
1952	46	45	24	22	4	3	—	—	—	—	74	70	8,492
1953	54	51	47	37	11	6	—	—	—	—	112	94	9,090
1954	53	48	34	25	36	16	1	1	—	—	124	90	9,609
1955	72	53	73	45	20	15	10	4	—	—	175	117	9,370
1956	97	55	81	46	34	26	2	2	—	—	214	129	11,005
Total	464	364	373	267	123	82	16	10	5	5	981	728	75,021

* Bacteriological examination only carried out on a proportion of the adult birds received for autopsy.
I. = Infected batches. O. = Outbreaks.

among chicks received in 1954 and 1955 (Table II) was due largely to infection disseminated from a single hatchery in Wales.

The steady increase in the number of fowl typhoid outbreaks encountered every year since 1948 is in agreement with the experience of other poultry diagnostic laboratories. This disease is no longer confined to two or three endemic areas in the country as was the case 15 to 20 years ago. Fowl typhoid is now a problem in all the Welsh border counties, the North and East Ridings of Yorkshire, and parts of Lincolnshire. It is no longer uncommon in the Midlands and scattered outbreaks are met every year in most other counties in England.

As in the case of pullorum disease, fowl typhoid is a rare disease in turkeys in this country, although outbreaks are not uncommon in areas where the disease has become endemic.

(c) *S. typhi-murium*

Outbreaks of *S. typhi-murium* infection are of primary importance to the rearers of turkey poults and ducklings and second only to pullorum disease in baby chicks. The increased number of outbreaks every year recorded in the present survey, as compared with that of Gordon and Buxton (1946), is accounted for by the greater number of chick batches received for examination reflecting the expansion of the industry since the war, particularly in regard to the sale of day-old turkey poults. The incidence of *S. typhi-murium* isolations expressed as a percentage of total chick batches examined every year is not higher than the figure given by Gordon and Buxton.

S. typhi-murium has a wider distribution among other avian species than any other salmonella serotype. It is a disease of economic significance in the chick, turkey poult, and duckling and the mortality at this age can be as serious as that resulting from pullorum disease; on the other hand, this organism is encountered more frequently than *S. pullorum* in individual chicks from batches where mortality has occurred from some other cause, particularly if cultures are prepared from the intestinal contents using an enrichment medium.

None of the isolations from adult birds was associated with epidemic disease and in few, if any, of the adult birds was the organism regarded as having caused death. The infection in the cage-birds was of a bacteraemic nature, but even here losses only occurred sporadically in the affected aviaries.

One of the outbreaks of *S. typhi-murium* infection in turkey poults recorded in 1954 was the origin of disease in man reported by Pereira and Blaxland (1955).

(d) *S. thompson*

S. thompson infection in chicks and turkey poults can cause serious loss in the affected batch, but this organism is comparatively rare in other species. Extensive outbreaks as reported by Gordon and Buxton (1945) have not been common in recent years and in some years, notably 1950 and 1954, this organism was of little significance.

(e) Other Salmonella types

The presence of some of the organisms, whose isolation is recorded in this survey, has not hitherto been recorded in poultry. This is not an uncommon experience when records are kept over a period of years. Reference to the tables shows that, with few exceptions, the occurrence of many of the unusual serotypes was confined to a single avian species in any one year. Investigation of these cases seldom revealed any origin for the infection in poultry. A study of the publications of other workers reveals similar sporadic occurrence of many of these organisms in other countries.

The majority of the isolations were from individual birds, often from cultures of the intestinal contents, and seldom was there any evidence of epidemic disease. *S. mbandaka*, for instance, was isolated from one of three poults supplied by a hatchery and breeding farm but investigation of the outbreak suggested that the heavy mortality in this one batch of poults was due to a dietetic disorder. Three other customers received poults from the same batch but there were no complaints from any of them. The chief exception in this respect was *S. stanleyville*

infection in turkey poults. This organism, not hitherto reported in this country in poultry, was isolated for the first time in 1955 from turkey poults on three separate premises in stock supplied by the same hatchery. The following year there were another 15 outbreaks in poults supplied by this hatchery. The mortality in some of these outbreaks was reported as being as high as 40 to 50 per cent., but it was impossible to assess accurately the part played by adverse environmental conditions; it was clear, however, that environment was the precipitating factor in many outbreaks. The infection at the hatchery was eventually overcome by a tightening of routine hygienic precautions but attempts to trace it to any one breeding flock were unsuccessful; blood tests, bacteriological examination of cloacal swabs and faecal samples from breeding turkeys were consistently negative for Salmonellae.

S. weybridge (0 = 3, 10; H = d : z_6), a new serotype, was isolated from the intestines of 2 of 4 ducklings brought into the laboratory from a local smallholding; there was no mortality or other evidence of ill-health in the surviving ducklings of this group.

The circumstances surrounding the isolations of *S. new haw* (0 = 3, 15; H = eh : 1, 5), another new serotype, were more interesting. In neither outbreak was the salmonella infection regarded as being of much significance; the organism was isolated in each case from the intestinal contents of poults aged about one week; in addition, in one outbreak *S. montevideo*, as well as *S. new haw*, was isolated from the liver of a single poult and in the other outbreak, aspergillosis was also present. The poults involved in these outbreaks were supplied from different breeding flocks, although both supplying farms and the customers were in adjacent counties. At about the same time a boy was taken ill whilst staying for a few days on another farm in the same area, and a Salmonella of the same serotype was isolated by the public health authorities and was already under examination at the Salmonella Reference Laboratory when the turkey cultures from Weybridge were sent to them for typing. 400 turkeys were being reared on the farm where the boy had been staying but a series of cloacal swab examinations and blood tests on turkeys on this farm failed to reveal any evidence of Salmonella infection; these tests, however, were carried out about 2 months after acute infection might have been present in the turkeys. The turkeys had reared normally without any unusual mortality.

(f) Untyped Salmonella organisms

The 17 cultures under this heading all gave the biochemical reactions of the Salmonella group but serologically there was positive "O" agglutination only; the organisms all proved to be non-motile and detailed classification was therefore not possible. The majority of the untyped cultures were agglutinated by group "B" O antiserum; phage typing and confirmatory tests carried out at the Salmonella Reference Laboratory on a typical strain led to the assumption that these cultures were probably non-motile strains of *S. typhi-murium*. Investigations of these outbreaks revealed nothing of significance.

Part II

Control and Prevention of Salmonellosis

(a) Pullorum disease

An indication of the progress made in the control of pullorum disease is provided by consideration of the figures in Table IV which combine those of the present report, in addition to those for the years 1933-44 (Gordon & Buxton, 1946). These results are also shown graphically on Fig. 1. It can be claimed that the incidence of outbreaks of pullorum disease in England and Wales has been markedly reduced in the last 20 years by the policy of the Animal Health Division of the Ministry of Agriculture based on the Poultry Stock Improvement Plan. But the aim in relation to pullorum disease in breeding flocks should be eradication rather than control and considered from this angle the progress has been disappointing in recent years. The percentage of breeding flocks in which one or more

TABLE IV

PROGRESS OF PULLORUM DISEASE CONTROL

Year	Total batches of chicks	Number of infected batches as percentage of total examined	Year	Total batches of chicks	Number of infected batches as percentage of total examined
1933	433	31·9	1945	1,255	20·0
1934	422	34·1	1946	1,290	20·0
1935	368	35·6	1947	1,351	13·2
1936	282	27·3	1948	2,100	12·8
1937	351	20·2	1949	1,664	11·6
1938	359	28·4	1950	1,226	12·3
1939	488	24·6	1951	1,824	9·8
1940	423	25·1	1952	2,187	7·9
1941	424	22·9	1953	2,475	8·4
1942	834	22·5	1954	2,254	5·06
1943	903	21·4	1955	2,366	5·4
1944	1,291	24·3	1956	2,326	3·0

TABLE V

PROGRESS OF PULLORUM DISEASE ERADICATION

Year	Number of flocks blood tested	Percentage of flocks infected*
1939	490	39·0
1940	502	38·4
1941	1,036	41·0
1942	723	38·5
1943	810	31·1
1944	841	31·0
1945	3,191	30·0
1946	3,537	29·0
1947	3,851	21·0
1948	4,624	21·0
1949	4,538	17·0
1950	4,150	15·0
1951	3,895	15·0
1952	3,966	13·0
1953	3,873	11·0
1954	3,854	9·0
1955	4,054	9·1
1956	4,240	9·2

* Infected flocks are those in which one or more "reactors" to the agglutination test were disclosed during the annual blood test.

reactors are disclosed at the annual blood tests carried out under the Poultry Stock Improvement Plan, has not continued to fall as rapidly as might have been expected and it is clear that the hard core of infection in the breeding flocks of this country has now been reached (Table V). It remains to be seen whether further progress will be possible within a voluntary scheme but experience with other diseases suggests that compulsory powers may be necessary to complete the work of pullorum disease eradication.

Certain of the problems and difficulties encountered during pullorum disease eradication have already been discussed (Blaxland, 1954) and the results of the serological examinations of 1,007 cultures of *S. pullorum* have been published (Blaxland, Sojka & Smither, 1956). The position in regard to the occurrence of pullorum eradication has not changed in recent years. The number of variant strains encountered continues to be insignificant; nevertheless, every culture isolated in the laboratory from chicks or adult fowls is examined serologically for evidence of form variation.

The marketing of the drug furazolidone has provided another weapon with which to combat outbreaks of pullorum disease occurring on commercial rearing plants (Williams Smith, 1954a; Wilson, 1955). Although there has been a certain conflict of opinion as to the effect of the drug on chronic infection in the ovary of the adult "carrier" of the disease, there is general agreement that furazolidone is of value as an adjunct to blood testing when infection has become widespread in a breeding flock (Gordon & Tucker, 1955; Wilson, 1956; Gordon & Tucker, 1957).

(b) Fowl Typhoid

The eradication of pullorum disease and fowl typhoid from the breeding flocks of this country through intensification of the blood testing policy is forseeable in the future, but eradication of fowl typhoid from commercial flocks by this means is probably impracticable. Treatment of infected flocks with furazolidone following the recommendations of American workers (Cosgrove, 1954; Harwood & Stunz, 1954) is now practised widely in this country, although field results (Harbourne & Sellers, 1955) are sometimes disappointing following the encouraging laboratory experiments of Williams Smith (1954b, 1955a).

The use of dead vaccines for the prevention of fowl typhoid has long been of doubtful value (Wilson, 1956), but the work of Williams Smith (1956a, b) in the laboratory and Harbourne (1957) in the field suggests that a live vaccine capable of conferring a worthwhile immunity without any undesirable reactions is a practical possibility.

(c) *S. typhi-murium* infection

This organism represents a major threat to the successful operation of turkey hatcheries and other suppliers of poults; to a lesser extent it is also a source of concern to the supplier of chicks.

Furazolidone has again proved of value in reducing the actual mortality in infected batches of poults, chicks, and ducklings (Wilson, 1955; Williams Smith, 1955b), but the latter author, in particular, emphasised that the drug was less successful in eradicating infection from the survivors of an outbreak than was the case with pullorum infection. There is general agreement that the retention of survivors as potential breeding stock is undesirable after treatment.

Contamination of the shell of the egg with infected faeces and subsequent penetration of the organisms to the yolk has long been recognised as the most likely means by which Salmonella infection of the egg yolk might occur (Wilson, 1945; Buxton & Gordon, 1947; Karlshoj & Szabo, 1949); furthermore, *S. typhi-murium* and *S. thompson* are the common serotypes found in the intestinal tract of adult fowls (Buxton & Gordon, 1947). It follows therefore that the control and prevention of *S. typhi-murium* infection is very largely a matter of maintaining a good standard of hygiene at the hatchery. In the majority of outbreaks investigated by the Animal Health Division, failure to carry out the precautionary measures laid down under the Poultry Stock Improvement Plan proves to be the chief factor responsible. The most common fault is failure to practise routine fumigation of eggs prior to incubation or the use of inadequate quantities of formalin and potassium permanganate. In some outbreaks investigated from Weybridge, in particular those involving turkey poults, the recommendations of Gordon, Harry, and Tucker (1956), in relation to the dipping of eggs in germicidal dips, have been applied as an adjunct to formalin fumigation.

Occasionally outbreaks of salmonellosis are encountered where tightening up and maintenance of strict hatchery hygiene are not successful in preventing the introduction of infection and on these occasions the possibility of true egg transmission has to be considered as opposed to shell contamination. Ovarian infection with Salmonella serotypes other than *S. pullorum* and *gallinarum* is uncommon, but it does occur and there are records of the isolation of *S. typhi-murium* and *S. thompson* suggesting primary yolk infection in the fowl (Wilson, 1948, 1950), in turkeys (Hinshaw, 1937, 1952; Fenstermacher, 1952), and in ducks (Kraneveld & Erber, 1940; Blaxland & Blowers, 1951).

Thus, failure to control an outbreak of disease in chicks or poults by improved hatchery hygiene requires that an effort be made to ascertain the amount of infection present among the adult birds in the breeding flocks concerned in the outbreak. The elimination of "carriers" of Salmonella serotypes other than *S. pullorum* and *S. gallinarum* from poultry flocks has proved extremely difficult largely because antibody titre in the blood serum is liable to fluctuate considerably and at any one time an infected bird may be serologically negative and at another positive to either or both "O" and "H" antigens; negative agglutination tests on a flock cannot, therefore, be regarded as conclusive evidence of freedom from infection (Gordon & Garside, 1944; Gordon & Buxton, 1945; Karlshoj & Szabo, 1949; Blaxland & Blowers, 1951). Nevertheless, the agglutination test has been widely used in America in conjunction with other measures to control *S.*

typhi-murium infection in turkeys (Hinshaw & McNeil, 1943; McNeil & Hinshaw, 1951; Delay *et al.*, 1954). Delay *et al.* (1955), however, emphasised, in a progress report on the results of the testing service they had initiated, that continued infection in tested flocks was related to management and failure to comply with recommended sanitary measures.

In outbreaks of *S. typhi-murium* infection in this country, involving fowls, turkeys, and ducks, the agglutination test has proved useful in assessing the relative importance of yolk-borne infection as opposed to shell contamination and faulty incubator hygiene in particular outbreaks. The test is not applied on the assumption that it will detect all the "carriers" of infection in a breeding flock but merely as a screening test in association with the other measures already mentioned for controlling an outbreak. Occasionally the number of positively reacting birds justifies the conclusion that infection is widespread in a particular flock and that in consequence yolk infection is a more likely eventuality; on the other hand, the application of the test may reveal only sporadic "reactors" in the suspected flock and bacteriological examination often proves negative on these individual reacting fowls and turkeys, thus suggesting a transient intestinal infection as opposed to a generalised or even localised tissue infection.

The use of a stained typhi-murium antigen. Most of the published accounts of agglutination testing for control of *S. typhi-murium* infection relate to the use of the tube test but the technical difficulties of carrying out several hundred tube agglutination tests in a laboratory, which is no longer staffed or equipped for this work, are considerable. Gwatkin and Dzenis (1954) found that whole blood tests with homologous antigens were more satisfactory than tube tests with heterologous antigens in detecting adult fowls artificially infected with *S. typhi-murium*. In recent years a stained typhi-murium antigen has been prepared at Weybridge from a field strain of the organism and used first in laboratory trials and then experimentally in the field.

The preparation of the stained antigen has not presented any major difficulties provided care is taken in the selection of a suitable strain of the organism. No attempt is made to ensure the presence of phase 2 flagellar factor as earlier work using both diphasic and monophasic strains did not suggest that antigen made from the former was any more effective in detecting infected birds than that made from monophasic strains. During the course of this work, it was noticed that certain strains of *S. typhi-murium* possess the ability of agglutinating both fowl and turkey erythrocytes to such an extent as to mask completely any agglutination of the bacteria should it have occurred; this characteristic proved to be inherent in the organisms and took place with unstained suspensions. Direct bacterial haemagglutination was first described many years ago (Neter, 1956), and Harris and Williams (1957) have since described the same reaction with specific reference to *S. typhi-murium*.

The preparation of typhi-murium antigen is similar to that of the rapid stained pullorum antigen made at Weybridge (Blaxland, 1954), the only difference being that the bacterial suspension obtained from the Roux flasks is not treated with alcohol. The bacterial growth is washed off with formol saline and kept in cold storage until required for use. The use of formalin in the preparation of an antigen containing both somatic and flagellar factors requires explanation. When resuspending the bacterial emulsion prior to standardisation and staining, a high-speed, automatic blender is used and it is believed that the mechanical battering to which the suspension is subjected is sufficient to break down the bacterial bodies, thus releasing the somatic factor in the antigen. Whatever the explanation, the finished product prepared in this manner contains a full quota of "O" and "H" antigens as judged by agglutination with both "O" and "H" specific sera.

This rapid stained typhi-murium antigen has been used during recent years on flocks of turkeys, fowls, and ducks. Tube samples are collected from all individuals giving positive or inconclusive reactions to the rapid test, the birds being leg-banded and the samples despatched to the laboratory for tube testing using both "O" and "H" phase I and phase 2 factors. There has been close agreement between the results obtained with the 2 tests when dealing with the clearly positive rapid test birds, but there would seem to be a greater degree of non-specific agglutination in certain flocks than is usually encountered in routine pullorum testing using the rapid whole blood test. The stained antigen was no more successful in detecting the "carrier" bird whose agglutinin titre had fallen than is the tube agglutination test and it was not unusual to obtain positive cloacal swabs or to isolate the organism from the tissues of non-reacting or inconclusively reacting birds. These difficulties have already been mentioned but, nevertheless, it is clear from experience in this country and also from the work published in America that agglutination testing can play a significant part in controlling and preventing outbreaks of *S. typhi-murium* infection when used as an adjunct to the conventional methods of disease control, and it is suggested that there are good grounds for using a stained antigen as a rapid whole blood test.

(d) Other Salmonella infections

With the exception of pullorum disease, fowl typhoid, *S. typhi-murium*, and to some extent *S. thompson*, Salmonella infections in poultry in recent years can be disregarded as factors causing disease of economic significance. On the other hand, from the point of view of the diagnostic laboratory, the isolation of these organisms cannot be altogether ignored as they constitute a potential threat, particularly to groups of young birds. Field reports in many of these cases suggest that adverse environmental conditions in connexion with the rearing of the birds, particularly in relation to the diet, are the primary cause of loss and unthriftiness rather than the specific bacterial infection; no doubt an adverse environment constitutes an additional stress on individuals, thus permitting the organism to establish

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itself, in some cases resulting in a bacteraemia. Surveys have been carried out in recent years (Cruickshank & Williams Smith, 1949; Williams Smith & Buxton, 1951) showing that a variety of Salmonella serotypes occur naturally in domestic animals and birds; Walker (1957), with results following the examination of organic fertilisers, has provided further evidence of the wide natural distribution of these organisms and it is clear that the importance of their isolation in the course of routine diagnostic work should not be exaggerated unless field investigation suggests an epidemic outbreak. It should, however, not be forgotten that many of the organisms encountered sporadically in poultry were first isolated from outbreaks of human disease and their presence in domestic birds and animals is, therefore, of some significance from the public health point of view.

Acknowledgments.—The authors are greatly indebted to Dr. Joan Taylor of the Salmonella Reference Laboratory, Colindale, for help and encouragement received over a long period of years in connexion with the work on which this paper is based.

Thanks are also due to the staff of the Veterinary Investigation Centre, Bristol, for their help in investigating the outbreak of *S. new haw* infection in turkeys, and to many members of the field staff of the Animal Health Division for field reports on certain other outbreaks.

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HOLIDAY EXCHANGES

We have now received some further requests for hospitality from the Continent, and among them are the following suggestions:—

France

Jean-Jacques Bonin, aged 15, hopes to visit this country on an exchange basis for 15 days in either August or September, and to entertain his host for a similar period in the Loire district of France.

Alain Dubreuil, aged 13, wishes to arrange a holiday in England on an exchange basis for 1½ to 2 months this year. If possible, he would prefer to stay either in the country or in a coastal town. He has three younger brothers and a sister, and he lives in a country district in the department of Ain.

François Saint Martin and Alain Moll, aged 16 and 17 respectively, are anxious to find accommodation in the same family or in the same town. Both of them speak a little English, and they would like to stay for 15 days to a month, preferably during August of this year, and to travel back to France with their hosts. François comes from Deux Sèvres and Alain from Charente.

Pierre Bérujon, aged 15, also speaks a little English and he would like to entertain an English boy at his home in Saône-et-Loire for 3 or 4 weeks, either returning to England with his guest this year or arranging for an exchange holiday in 1959.

Jean and Claude Raisky, aged 18 and 17 respectively, would like to come to England for a month at some time between June 15th and September 15th and to teach French in exchange for hospitality. They would prefer to stay in or around London.

Germany

Dr. E. Fuchs, a veterinary surgeon living near Munich, would like to arrange a holiday on an exchange basis for his daughter, aged 13, during the months of July and August.

Members of the profession interested in contacting any of the above are asked to write to THE VETERINARY RECORD at their earliest convenience.

The Complement-fixation Test in the Diagnosis of Johne's Disease in Cattle

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SUMMARY.—The complement-fixation test for Johne's disease was repeatable within practical limits of accuracy. Although minor variations occurred, no positive test on a serum sample became negative on repetition, or vice versa.

In experimentally infected calves it was 3 months after infection before complement-fixing antibodies were demonstrated in the sera. In many cases this time was considerably protracted.

Twenty-seven out of 28 cattle (96 per cent.), all having experimentally induced Johne's disease, gave a positive reaction to the test. In the exceptional case the course of the disease from infection to death was extremely rapid (7 months). The impression is that the titre was directly related to the extent of the intestinal lesions and not necessarily to the severity of the symptoms.

In a sample of cattle believed to be free from contact with M. johnei *96 per cent. gave a negative test.*

The mere presence of M. johnei *within the animal system was not sufficient to give a positive reaction. Thus the test frequently failed to diagnose "carrier" animals.*

Between 10 and 20 per cent. of the adult cattle on two farms where the disease does not exist gave positive reactions.

On one farm where the infection exists but the disease is not a serious problem up to 40 per cent. of the adult cattle gave a positive test.

It is postulated that some form of non-specific activity which this test detects can occur in a herd, and that the effect of this activity is of a transient nature.

Introduction

WHEN Twort and Ingram (1913) had succeeded in growing *Mycobacterium johnei* for the first time they quickly began to use their cultures for the preparation of antigens for use in agglutination and complement-fixation tests. The sera from 7 naturally occurring clinical cases of Johne's disease in cattle were tested for complement-fixing antibodies to *M. johnei*. Five of them gave a positive test, one was doubtful, and one was negative. On another occasion the sera from five 6-month-old calves, which had been experimentally infected with *M. johnei* shortly after birth, were tested. All were negative, although on *post-mortem* examination their intestines were thickened and acid-fast bacilli were recovered. Twort and Ingram summed up their experiences with the test in these words: "the complement-fixation test will not prove of much value as a practical diagnostic test in Johne's disease." About the same time Bang (1914), who was also using the C.F. test quite extensively, made these observations: "the complement-fixation test is of no small importance in the diagnosis of paratuberculosis," and, "the complement-fixation test has proved a valuable diagnostic means in the case of tuberculosis-free herds. All severely affected animals give positive reactions on this test."

For nearly 20 years little seems to have been added to these opposing views until Hagan and Zeissig (1933) examined the results obtained with the test in one experimentally infected herd and in a number of commercial herds in the U.S.A. They concluded that the test was not specific and that it would have a limited value in the field unless some way could be found to increase its specificity. They were, however, of the opinion that the test was, "in most instances," positive after symptoms of the disease had developed.

A further 20 years passed before the complement-fixation test was again tried for the diagnosis of Johne's disease, this time by Hole (1952). One of the difficulties encountered by the previous workers had been the cross-reaction with tuberculosis, and Hole thought that the large increase in the number of cattle herds known to be free from tuberculosis made it practicable to use the test exclusively in such herds. He also introduced modifications in technique which he believed increased the specificity of the test. Hole has published various articles in the nature of interim reports (Hole, 1952, 1952a, 1953, 1953a) but so far no final assessment of the test's value has been made. He has, however, indicated that the test has an accuracy of about 95 per cent. in clinical cases of Johne's disease, and in his most recent paper (Hole, 1956a) he has described the eradication of Johne's disease from a herd of about 50 cattle by the removal from the herd of all reactors to the test over a period of years.

Using Hole's technique Chandler (1955) investigated the test in cattle in New Zealand. He found that of 27 cattle known to have Johne's disease 25 (93 per cent.) gave a positive result. However, of 64 cattle showing no evidence of Johne's disease at *post mortem* 12 (nearly 20 per cent.) gave either a positive or doubtful test. He expressed the opinion that the test was the best available for diagnosing Johne's disease in its clinical stages but that it was unlikely that the test could be used on its own in any large-scale eradication scheme.

At this laboratory during the past 4 years the opportunity to apply Hole's complement-fixation test to various groups of cattle has from time to time presented itself. The results of these tests form the basis of the paper.

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Materials and Methods

The complement-fixation test was carried out in the manner described by Hole (1956). The concentrated antigen was kindly supplied by him and used at his recommended optimal dilution. Pooled guinea-pig serum was used as a source of complement. It was dispensed in 2-ml. amounts and stored at −20° C. until required. Sheep-cell haemolytic serum was obtained from Burroughs Wellcome & Co., London.

The sera under test were diluted 1/5 with 0.85 per cent. saline after inactivation at 56° C. for half an hour. Tests were read visually and the following symbols and interpretations have been used throughout this paper:—

Test result	Symbol	Interpretation
Complete fixation	++++	Positive
Trace of haemolysis	+++±	Weak positive
75 per cent. fixation	+++	Negative*
50 " "	++	"
25 " "	+	"
No fixation	0	"

* Roughly equivalent to Hole's " doubtful " category.

Cultural examinations for the presence of *M. johnei* were carried out by the methods described by Taylor (1950).

Applications of the Test

I. *The Ability of the Test to Yield Consistent Results*

In order that the comparative accuracy of tests carried out at different times might be assessed the same serum samples were tested on a number of occasions and the results were compared.

Serum samples from 26 cattle were divided into 4 × 1 ml. amounts and kept at −20° C. On four successive occasions within one week one of the samples from each batch of four was withdrawn and tested.

The results are shown in Table I. A very good co-relation between successive samples was obtained particularly in those sera which showed either complete or no fixation. The greatest differences occurred in the intermediate degrees of fixation but, as in the final assessment all samples showing more than a trace of haemolysis have been interpreted as negative, this is not important.

II. *The Development of Complement-fixing Antibodies*

Twenty-eight calves were inoculated intravenously with varying doses of *M. johnei* when they were one month old. Thereafter they were bled at monthly intervals for 6 months and then at intervals of approximately 2 months until killed at up to 18 months after inoculation. The sera from these samples were tested for the presence of C.F. antibodies and the results are shown in Table II.

Complement-fixing antibodies did not appear in significant amounts until 3 months after inoculation. At this time, however, the sera from more than one half of the animals still contained no detectable antibody. By the ninth month all but two had given a positive result, and one of these became positive within the year. (The other (T.2) had been killed at 7 months as a clinical case of Johne's disease.)

TABLE I

SHOWING THE RESULTS OBTAINED WHEN THE SAME SERUM SAMPLES WERE TESTED FOR COMPLEMENT FIXING ANTIBODIES ON DIFFERENT OCCASIONS

Reference No.	Results			
	1st Test	2nd Test	3rd Test	4th Test
124	0	0	0	0
403	0	0	0	0
411	0	0	0	0
435	0	0	0	0
28	++++±	+++±	+++	
J42	++++±	+++±	++	
37	++	++	+++	
208	++++	++++	+++±	+++±
227	++	+	+	0
459	++++	++++	++++	
115	++	0	0	
375	+++	++	++	0
155	++++	++++	++++	++++
601	0	0	0	0
446	++++	++++	++++	++++
N140	+++±	+++±	+++±	+++±
21	+	+	0	0
510	++++	+++±	+++±	+++±
643	0	0	0	0
437	0	0	0	0
578	++++	++++	++++	++++
293	+	0	0	0
549	++	0	+	0
427	+	0	0	0
56	+	0	0	0
N149	+	0	0	0

For symbols see Materials and Methods above

The general picture given by these results is not one of a gradual build-up of antibody, but rather one of no antibody followed at the next test with antibody in considerable amount. More frequent testing, however, might reveal a different picture.

III. *The Application of the Test to Cattle with Johne's Disease*

Not all cattle which are infected with *M. johnei* necessarily have Johne's disease (Taylor, 1949, 1952; Rankin, 1954; Smith, 1954). Under the above heading only cattle which, at *post-mortem* examination, were found to have typical lesions of the disease in the intestines are being considered. All the animals in Table II fell into this group. Some, but not all, such animals were clinical cases.

Twenty-seven of the 28 diseased cattle (96 per cent.) gave a positive (or weakly positive) result before slaughter. The exception (T.2) suffered a very rapidly developing attack of the disease and was killed as a clinical case only 7 months after being infected. She gave 2 consecutive rather doubtful tests just prior to slaughter.

Animals which had become positive did not necessarily remain positive. Some gave fluctuating tests and some, on occasions, even failed to show the presence of any detectable antibody at all.

The *post-mortem* examination of these cattle, and others not here referred to, seems to suggest that

TABLE II

SHOWING THE DEVELOPMENT OF COMPLEMENT-FIXING ANTIBODIES IN CATTLE WHICH CONTRACTED JOHNE'S DISEASE AS A RESULT OF THE INTRAVENOUS INOCULATION OF MYCOBACTERIUM JOHNEI

Reference number	Dose in mg.	Months after infection								
		1	2	3	4	5	6	7	8	9
559	100	0	0	++++	++++	++++	++++		++++	
155	,,	0	0	+++	++++	++++	+		++++	
M44	,,	0	0	0	0	0	0		++++	
168	,,	0	0	0	0	+++	+++		+++±	
299	,,	0	0	0	0	+++	+++		++++	
N149	,,	0	0	0	0	0	0		++++	
T137	,,	0	0	+++	++++	++++	++++	K		
T175	,,	0	0	+++	++++	++++	++++	K		
T 27	,,	0	0	+++	++++	++++	++++	K		
N 80	,,	0	0	0	+++	+++	+++±	K		
R625	,,	0	0	0	+++	+++±	++++	K		
40	,,	0	0	++++	++++	++++	++++	K		
279	,,	0	0	0	+++	+++	++++	K		
372	,,	0	0	0	0	0	+++±	K		
177	10	+	0	++	++	+++	+++		++++	
446	,,	+	0	++++	++++	++++	+		++++	
N140	,,	0	0	+++	++++	+++	+++		+++	
21	,,	+	0	++++	++++	++++	++		+++±	
272	,,	0	0	0	0	0	0		++++	
549	,,	0	0	0	0	0	0			0
237	,,	0	0	0	++	0	++++			++++
T 2	,,	0	0	0	++	+++	+++	K		
544	,,	0	0	0	++	0	+++±			++++
356	,,	0	0	0	+	++	++++			++++
600	1	0	0	0	0	0	0			++++
N84	,,	0	0	0	0	0	0			+++±
570	,,	+++	+	+++±	++++	++	+		+++	
578	,,	++	+	++++	++++	++	++		++	

K = Killed
For other symbols see Materials and Methods above.

TABLE II—*continued*

Reference number	Dose in mg.	Months after infection								
		10	11	12	13	14	15	16	17	18
559	100	++++			++++	K				
155	,,	++++			++++	K				
M44	,,	++		+++±			+		K	
168	,,	+++±		K						
299	,,	++++		++++			++++	K		
N149	,,	0		+++			0		K	
T137	,,									
T175	,,									
T27										
N80										
R625	,,									
40	,,									
279	,,									
372	,,									
177	10	++++			++++			K		
446	,,	++			++++			K		
N140	,,	+			0			K		
21	,,	+			0			K		
272	,,	++		0			++++		K	
549	,,		+++±	K						
237	,,		++	K						
T2	,,									
544	,,		++++	K						
356	,,		+++±	K						
600	1		+++±	K						
N84	,,		++++	K						
570	,,	+++±			++++			K		
578	,,	+			++			K		

K = Killed
For other symbols see Materials and Methods above.

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the amount of complement-fixing antibody present is directly proportional to the extent of the intestinal lesion and not necessarily to the severity of the symptoms.

IV. *The Application of the Test to "Infected" Cattle*

It has already been noted above that some cattle showing no signs of disease do, in fact, harbour *M. johnei* in the lymphatic system. The term "infected" is here applied to such cattle only. A mesenteric lymph node (ileo-caecal) and a blood sample were taken from 316 graded cattle passing through an abattoir in the normal course of the meat trade. The serum from each blood sample was tested for C.F. antibody and each lymph node was cultured for *M. johnei*. The organism was recovered from 27 of the 316 cattle sampled but only 6 of these (22 per cent.) gave a C.F. test result which was interpreted as positive.

A further sample of healthy but "infected" cattle was studied. This consisted of 5 cows inoculated intravenously with 100 mg. *M. johnei* when they were 3 years old. When they were killed 4 years after inoculation none showed macroscopic evidence of Johne's disease but *M. johnei* was recovered culturally from the lymphatic system in each case.

Serum samples were tested for the presence of C.F. antibody 8 months after inoculation and then at intervals of approximately 3 months.

The results of these tests are shown in Table III. One cow gave a weakly positive result on a single occasion, but usually the interpretation was negative and in many cases no antibody at all could be detected. None of the cattle ever yielded a frankly positive result.

V. *The Application of the Test to Groups of Cattle Believed to be Almost Entirely Free from Contact with* Mycobacterium johnei

The physical effort involved in minutely examining nearly 2,000 inches of intestine plus a score or more lymph nodes, some of which may be 12 inches long, is outside the scope of normal experimental procedure. Add to this the uncertainty of the methods required to cultivate the organism and it can be appreciated that it is usually impossible to maintain that a bovine animal was not harbouring *M. johnei* at the time of death. If, however, the animals had come from an area where the disease was unknown, or had been born from healthy stock and reared in isolation this would be very strong circumstantial evidence of absence of infection.

It is generally believed that Ireland is free from endemic Johne's disease and the surveys of Rankin (1954) and Smith (1954) support this view. It is therefore highly probable that the great majority of cattle in Ireland do not have the opportunity for contact with *M. johnei*.

Serum samples from 234 cattle imported from Ireland for slaughter in this country were tested for C.F. antibodies. In only 9 cases (4 per cent.) was the test positive.

A further sample of cattle believed to be very largely free from contact with *M. johnei* exists on this Field Station. A few years ago 500 calves, many of which had not been allowed to suck on the farms of origin, were brought to this Field Station. They have been kept in isolation since their arrival. Two hundred and twenty-one of these cattle were tested when they were 5 years old and only 7 (3 per cent.) gave a positive result.

The above results are the reverse of those obtained in cattle known to have Johne's disease.

VI. *The Application of the Test to the Various Groups of Cattle Maintained at this Field Station*

There are 4 major groups of tuberculosis-free cattle kept at Compton. In (1) a dairy herd known to be infected with Johne's disease, 2 clinical cases of Johne's disease have occurred during the past 5 years and *M. johnei* has been cultivated from about 10 per cent. of the cattle disposed of for slaughter in the normal course of farm practice.

Groups (2) and (3) are also dairy herds and during the same 5-year period there have been no clinical cases of Johne's disease on either farm, nor has the organism been recovered from samples of *post-mortem* material from over 200 cattle.

Group (4) represents the animals kept in the isolation compound for experimental purposes other than Johne's disease experiments. Here, likewise, there have been no cases of Johne's disease and the organism has been cultivated only twice from over 200 *post-mortem* examinations. It is possible that these two animals were already infected at the time of birth on the farm of origin, or that they received infected colostrum from Herd (1) above.

During the period 1954 to 1956 C.F. tests were carried out on sera from the adult stock in Herds (1), (2), and (3). The results of these tests are summarised in Table IV. In the two non-infected herds

TABLE III

SHOWING THE RESULTS OF SUCCESSIVE COMPLEMENT-FIXATION TESTS CARRIED OUT ON THE SERA FROM CATTLE INFECTED WITH MYCOBACTERIUM JOHNEI BUT NOT SHOWING EVIDENCE OF JOHNE'S DISEASE *Post-mortem*

Reference No.	Dose in mg.	Months after inoculation												
		8	13	16	18	23	25	29	31	34	37	40	43	46
124	100	0	+++	++	+	0	+	0	++	+++	0	+++±	0	0
232	,,	+++	0	+++	+	+	++	++	+++	++	0	+	0	0
304	,,	0	++	++	0	0	+	0	++	+	0	0	0	0
411	,,	0	0	0	0	0	0	0	+	0	0	0	0	0
425	,,	++	++	++	+	+	++	0	0	0	0	0	0	0

there was a basic level of about 10 per cent. of positive reactors. In the infected herd the level fluctuated between this and nearly 40 per cent.

At the various tests it was not always the same animals which gave the positive results. In fact very few of the animals on any of the farms were consistently positive as can be seen from Table V.

Each year a number of cattle from the three farms and from the isolation compound are slaughtered and during the past few years the opportunity has been taken to make a cultural examination of the ileo-caecal lymph nodes of these cattle thus checking on the infection status of the herds. At the same time a blood sample was taken from each animal slaughtered and the serum tested for the presence of C.F. antibodies. The results of these examinations are shown in Table VI. About 20 per cent. of samples from the infected herd (1) were positive whereas only 5 per cent., or less, of samples from the two non-infected herds (2 and 3) and the minimally infected herd (4) were positive. On 5 occasions where *M. johnei* was cultivated the test was negative.

Discussion

There is already a considerable amount of evidence in support of the view that complement-fixing antibodies in detectable amounts are present in the sera of cattle affected with clinical, or immediately preclinical, Johne's disease (Bang, 1914; Hagan & Zeissig, 1933; Hole, 1952; Rosenberger & Krause, 1955; Chandler, 1955). In the present experiments, therefore, only a comparatively small number of such cattle were tested. The results confirm the findings of the previous workers and leave little doubt that an adult bovine animal which has contracted Johne's disease to the extent of having readily visible intestinal lesions will give a positive test in 95 per cent. of cases.

The experiment on the repeatability of the test has shown that over a short period consistently positive and negative results can be obtained on repeated testing of the same respective sera. This, however, may be an over simplification of the true situation. These successive tests were carried out using the same reagents. Over a period of years, however, it was found that the carrying out of the test was by no means trouble-free. Minute variations in the quantity of complement used and small variations in its quality could have a very marked effect on the end result. These difficulties were only partially overcome by storing complement in the frozen state and by reading degrees of haemolysis during titrations of complement on a colorimeter instead of by eye. If the test was to be used on a wide scale and controlled from regional laboratories the difficulties associated with ensuring a uniform standard would certainly be considerable.

Three months after infection complement-fixing antibody in significant amount had appeared in only 50 per cent. of the group of infected calves. It was a further 6 months before virtually all the group were giving positive tests. It should be noted that these

TABLE IV

SHOWING THE RESULTS OF APPLYING SUCCESSIVE COMPLEMENT-FIXATION TESTS FOR THE DIAGNOSIS OF JOHNE'S DISEASE TO THE THREE FARMS MENTIONED IN THE TEXT

Herd	No. of test	Date	No. positive	No. negative	No. tested	Percentage positive
1	1	10. 3.54	9	100	109	8
	2	10. 8.54	50	90	140	36
	3	22.11.54	38	78	116	32
	4	15. 4.55	10	139	149	7
	5	20. 7.55	30	120	150	20
	6	3. 5.56	31	131	162	19
	7	11. 9.56	14	140	154	9
2	1	25. 8.54	8	75	83	10
	2	29.11.54	18	64	82	22
	3	1. 4.55	6	71	77	8
	4	14. 7.55	15	69	84	18
	5	1.12.55	14	77	91	15
	6	11. 4.56	15	73	88	17
	7	17. 7.56	15	66	81	18
	8	31.10.56	14	72	86	16
3	1	23. 2.54	26	130	156	17
	2	17. 8.54	18	116	134	13
	3	10.12.54	19	126	145	13
	4	21. 4.55	13	127	140	9
	5	4. 8.55	11	108	119	9
	6	8.11.55	12	104	116	10
	7	25. 4.56	19	145	164	12
	8	22. 8.56	21	130	151	14

TABLE V

SHOWING THE NUMBERS AND PROPORTIONS OF REACTORS TO THE COMPLEMENT-FIXATION TEST FOR JOHNE'S DISEASE FOUND ON THE THREE FARMS MENTIONED IN THE TEXT

Herd	Approximate no. tested at each test	No. always positive	No. sometimes positive	Total reactors	Percentage reactors always positive
1	150	3	49	52	6
2	80	7	17	24	29
3	150	6	32	38	16
Totals	380	16	98	114	14

TABLE VI

SHOWING THE RESULTS OF CULTURAL EXAMINATIONS AND C.F. TESTS FOR JOHNE'S DISEASE CARRIED OUT AT THE TIME OF SLAUGHTER ON CATTLE FROM FOUR HERDS ON THE COMPTON FIELD STATION

C.F.T. Result	Culture Result	Herd No. 1	Herd No. 2	Herd No. 3	Herd No. 4
Positive	Positive	4	0	0	0
Positive	Negative	15	4	2	10
Negative	Positive	3	0	0	2
Negative	Negative	72	103	67	181
Total killed :		94	107	69	193
Percentage giving positive C.F.T.		20%	4%	3%	5%

(During the past five years Johne's disease has been seen occasionally in Herd (1) but not in Herds (2), (3) or (4).)

XUM

results relate to infections produced by the intravenous inoculation of *M. johnei*. The resulting disease runs a more rapid course than the naturally occurring one, and it is probable that antibody appears earlier in such experimentally infected cattle. It is therefore doubtful if it would be worth while testing animals of less than one year of age under field conditions.

In the case of the animal (T.2) which died from clinical Johne's disease only 7 months after infection, insignificant amounts of antibody were found in the tests before death. It would seem therefore that if the disease runs a very rapid course from infection to death there is less likelihood of obtaining a positive test.

The results obtained when the test was applied to sera from cattle which were harbouring *M. johnei*, but showing no evidence of disease *post mortem*, require comment. From a practical viewpoint none of the animals tested under this heading had Johne's disease and therefore the negative bias of the test results appears to be justified. On the other hand the presence of the antigen in the lymphatic system, a supposed seat of antibody production, without the production of antibody in detectable amount, seems remarkable. It would appear that fairly extensive lesions are necessary before circulating complement-fixing antibody is present in detectable amount.

The fact that over 75 per cent. of these "carrier" cattle can pass the test is disturbing. It is not known what the fate of such animals would be if left to live a little longer. They might continue to harbour the bacillus; they might overcome the infection; or they might break down and become clinical cases of the disease. Nor is it known if such animals are capable of passing infection to other animals.

Some countries do not permit the importation of cattle unless they have passed a complement-fixation test for Johne's disease. Such countries may well be keeping out clinical cases of the disease, or those that are about to become clinical cases, but it seems unlikely that they are keeping out the Johne's bacillus. This could be checked by cultural examination of the lymphatic system of the imported cattle when they eventually go for slaughter.

In the experiments described not all positive C.F. tests were related to the presence of Johne's disease and disconcertingly high proportions of positive reactors were found in the two dairy herds believed to be free from both the clinical disease and the presence of the Johne's bacillus. It would appear, therefore, that some other factor which was capable of influencing the test was operating. The fact that few of these reacting cattle remained positive at subsequent tests suggests that this influence is of a temporary nature and that a large number of cattle pass through a positive phase and then become negative again. This would also offer an explanation for the discrepancy between the percentage positive at the herd tests in herds (2) and (3) (10 to 20 per cent.) and the percentage positive in the cattle slaughtered from these herds (3.5 per cent.). The latter sample is not random but selected in that it contains mainly the older animals from the herds. This temporary reaction is probably non-specific in nature as repeated attempts to demonstrate the presence of *M. johnei* on farms (2) and (3) have consistently failed.

The above findings suggest that the modifications introduced by Hole have not entirely overcome the difficulties of non-specificity encountered by the earlier workers. In fact specificity may not be attainable with complement-fixation tests for Johne's disease in cattle. This does not necessarily mean that the test cannot be used (*cf*: tuberculin tests) but care will be needed in selecting subjects for its application and in the interpretation of the results. This interpretation may have to be made after a careful consideration of the *herd* history as is the case with tuberculin testing to-day.

Acknowledgment.—I should like to record my thanks to Mr. Hole for instruction in the use of the test, for supplying the antigen, and for the very generous help he has at all times given me.

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KENNEL CLUB RULING ON ENTIRE DOGS

In view of the new Show Regulations which will come into force on January 1st, 1959, to prohibit the exhibition of dogs which are not entire, the Committee of the Kennel Club draws attention to the following Regulation which is No. 2 of the Regulations for the Preparation of Dogs for Exhibition:—

"No cutting, piercing, breaking by force, or any kind of operation or act which destroys the tissue of the ears or alters the natural formation of a dog or any part thereof may be practised and nothing may be done calculated in the opinion of the Kennel Club Committee to deceive, except (a) operations certified to the satisfaction of the Kennel Club Committee to be necessary; (b) the removal of the dewclaws of any breed; (c) the shortening of tails of the following breeds," etc.

The object of the new Regulations is that by preventing the exhibition of dogs which are not entire, the use of these dogs at stud will decrease generally. If the condition of monorchidism and cryptorchidism is remedied artificially by injection or operation the object of the legislation is defeated as breeders may use such dogs at stud believing them to have been entire from the start.

The Committee of the Kennel Club therefore considers that any act which would make it appear that a dog is a normal, entire animal when it was, in fact, previously a monorchid or cryptorchid would be an act calculated to deceive and the owner would be liable to a complaint under Kennel Club Rule 17.

If this condition is rectified on the advice of a veterinary surgeon for the sake of the health and well-being of a dog, such a dog would still be ineligible for exhibition under Kennel Club Regulations.

News and Comment

PRESENTATION TO CAPTAIN G. ATKINSON

To mark the retirement of Captain G. Atkinson, Superintending Veterinary Officer, Exeter, a presentation was made to him after the recent annual general meeting of the Western Counties Veterinary Association, on behalf of the L.V.I.'s of Devon, Cornwall, and Dorset. The gift took the form of a tape recorder; and in presenting it Mr. H. Fraser of Tavistock, the senior L.V.I. present, having said it was in appreciation of a long, happy, and friendly association, continued:—

"I have been in contact with Captain Atkinson from the time he took up his present appointment, and I remember him as a junior at the Royal Dick when the third and fourth year men considered the first and second too young to fraternize with!

"In his official duties he has always been most helpful and approachable, and personally I have had a lot of good advice from him. If one were doubtful about anything one could always expect a fair and most courteous hearing.

"On behalf of the L.V.I.'s of Devon, Cornwall, and Dorset, I have the pleasure of presenting you, Captain Atkinson, with this tape recorder. I believe it may be helpful in your love of music, and we all wish Mrs. Atkinson and yourself a long and happy retirement, and that you may still carry on your valuable work for the profession."

Captain Atkinson is, of course, a member of the Council of the B.V.A. and of the Royal College.

VICTORY MEDAL PRESENTED TO MR. J. K. BATEMAN

At the all-day meeting of the Central Veterinary Society, held on April 17th, the President of the Society, Dr. E. Cotchin, presented to Mr. J. K. Bateman the Society's Victory Medal for the year 1958.

In making the presentation, Dr. Cotchin said:—

"It is my pleasant duty now—perhaps the pleasantest task that falls to the lot of the President of this Society—to present the Victory Medal to Mr. J. K. Bateman.

"As you know, a gold medal, called the Victory Medal, was instituted in the year 1918 to commemorate the victory of the Allies in the Great War, 1914-18. It may be awarded annually, at the discretion of the Council, to a person who has rendered outstanding service either to the Society or to veterinary science in general.

"The list of Victory Medallists is a clear indication of the way in which over the years the Society has been able to do honour to itself, as well as to the recipients, by the award of this medal, and I would like to read the list through to you—it contains 36 names, some of men who are happily still with us. Listen to these names, how they resound in the annals of the profession!

"H. A. MacCormick, F. T. Harvey, F. T. G. Hobday, E. L. Stroud, J. B. Buxton, J. MacIntosh, G. H. Wooldridge, J. Rowe, J. MacQueen, J. F. Macdonald, G. W. Dunkin, W. K. Townson, W. Perryman, J. Moore, H. Gray, J. G. Wright, H. D. Jones, T. Dalling, W. H. Kirk, J. T. Edwards, S. L. Hignett, F. Bullock, G. Dunlop-Martin, J. McCunn, H. E. Bywater, C. A. Murray, T. L. Wright, W. A. Pool, G. O. Davies, G. P. Male, W. R. Wooldridge, T. Hare, A. L. Sheather, C. Roberts, R. F. Wall, G. N. Gould.

"To-day it is our privilege to add to this list the name of J. K. Bateman; there can be few of you who are unaware of Mr. Bateman's many qualifications to be our newest Medallist, but I would like to present a very brief outline of his career. Mr. Bateman served in the Field Artillery in the 1914-18 war, and then went to the Dick College, from which he qualified in 1922. He was then in equine practice for 3 years in Manchester, and for a further 5 years in mixed practice in Knutsford in Cheshire. Next, for a short period he worked at Burroughs Wellcome under Dalling; one of the diseases with which they were concerned—canine distemper—has formed one of Mr. Bateman's interests ever since. His major life's work has of course been done in connexion with the racing greyhound, with which he has worked at Northaw for 26 years. He is an acknowledged expert in the greyhound field, the man and the opportunity coming most favourably together. The average number of dogs passing through the kennels each year is about 1,200, and the average number actually in the kennels is about half this total.

"The two main problems to which Mr. Bateman has given his attention are the control of distemper, and the development of orthopaedics in relation to the racing greyhound. He has often spoken to the Central on these subjects, and has written to much effect in THE RECORD on such subjects as cramp, distemper vaccination, post-distemper diseases, injuries to the stifle, and repair of fracture of the os calcis.

"Mr. Bateman has always been a very modest man, and I will say no more now than that we feel very proud to be able to add his name to our list of Victory Medallists."

THE BRITISH VETERINARY POULTRY ASSOCIATION

The spring meeting of the Association was held at the Royal Veterinary College, London, on April 10th. Dr. R. F. Gordon, the President, was in the chair and there was a large attendance of members and guests.

At the morning session a paper on "The Respiratory Disease Complex" was presented by Professor R. A. Bankowski of the University of California, Davis, and in the afternoon Professor F. W. Lorenz, Professor of Poultry Husbandry in the same University, presented a paper on "Recent Researches on Problems of Fertility in Chickens and Turkeys."

The papers were of great interest to members and evoked a good discussion.

PIG INDUSTRY DEVELOPMENT AUTHORITY SCHOLARSHIPS

It is the Authority's intention to offer post-graduate scholarships, tenable for a period of two or three years, as from the end of the current academic year, to suitable graduates in veterinary medicine or in agriculture. The Authority are prepared to grant scholarships initially of a value of £500 a year; and they would expect to budget additionally for overhead expenses or the cost of assistance or equipment appropriate to the particular case.

The Authority, at this stage, envisage the award of two post-graduate scholarships in veterinary medicine and four to other graduates.

Applicants should provide a sufficient indication of the line of work proposed to be undertaken, of the methods to be used, of the facilities that will be required, and of the place where they would wish to work if other than that where they are now studying. Applications should be submitted through the applicant's present tutor or supervisor of studies.

PERSONAL

Mr. G. N. Gould, President of the R.C.V.S., left Heath Row on Saturday and will spend two days as the guest of the Dean of the Veterinary School of Cornell University, Dr. Hagan. He will then fly on to Jamaica where he will be the guest of the Governor, Lord Hailes.

Marriages

CAMERON—MORRIS.—At St. Paulinus Church, St. Paul's Cray, Kent, on March 15th, 1958, Reginald Scott Cameron, M.R.C.V.S., son of Mr. and Mrs. J. Cameron of 107, Twyford Road, Harrow, Middlesex, to Helen Morris, daughter of Mr. and Mrs. Morris of 44, Kelsey Road, St. Paul's Cray, Orpington, Kent.

STOKES—THOMPSON.—On April 26th, 1958, at St. Botolphs, Worthing, Peter M. Stokes, M.R.C.V.S., of Colston Bassett, Notts, to Jean M. Thompson of Worthing, Sussex.

THE REGISTER OF VETERINARY SURGEONS

The names of the under-mentioned gentlemen were removed from the Register of Veterinary Surgeons on April 23rd, 1958, in accordance with the provisions of Section 25 (3) of the Veterinary Surgeons Act, 1948, and Statutory Instrument No. 1729 of 1957:—

Ali, Syed Mahmud, 27, Nawab Katra Road, Dacca, East Pakistan; Canham, Anthony South, P.O. Box 405, Pietermaritzburg, Natal, South Africa; Das, Madhu Sudan, Bengal Veterinary College, Calcutta, 37, India; Mehra, Hari Kishan, Director of Veterinary Services, Madhya Bhart Govt., Gwalior, India; Patra, Mohit Kumar, Deputy Director of Animal Husbandry, Cuttack, Orissa, India; Woulfe, Maurice Richard, Veterinary Dept., Musoma, Tanganyika.

COMING EVENTS

May

7th (Wed.). First Annual General Meeting of the B.S.A.V.A. Midland Region at the Queen's Hotel, Birmingham, 2 p.m.

8th (Thurs.). General Meeting of the Lancashire Veterinary Association in Room 48, Victoria Building, University of Liverpool, 2.30 p.m.

9th (Fri.). Meeting of the R.A.V.C. Division at the R.A.V.C. School and Stores, Thornhill, Aldershot, 12 noon.

General Meeting of the North of Ireland Veterinary Association at the Whitla Medical Institute, College Square North, Belfast, 7.30 p.m.

10th (Sat.). Annual Dinner-Dance of the Chiron Club at the Royal Hotel, Bristol, 6.30 p.m.

Annual General Meeting of the Scottish Regional Group of the A.V.T. & R.W.'s at the University of Glasgow Veterinary Hospital, Bearsden Road, Bearsden, Glasgow, 10.45 a.m.

Meeting of the B.S.A.V.A. North West Region (No. 9) at the Queens Hotel, Piccadilly, Manchester, 8.15 p.m.

10th and 11th (Sat. and Sun.). 6th Annual Reunion of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring-on-Thames.

15th (Thurs.). Annual General Meeting of the Supplementary Register Division at 7, Mansfield Street, Portland Place, London, W.1, 3 p.m.

Ordinary General Meeting of the South Eastern Veterinary Association at the Royal Star Hotel, Maidstone, 6.30 p.m.

16th (Fri.). Annual General Meeting of the Society of Practising Veterinary Surgeons in the Station Hotel, York, 2.30 p.m.

Annual Ball of the R.V.C. Students' Union at the Royal Veterinary College, London, N.W.1, 9 p.m.

21st (Wed.). Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Society's House, 5 p.m.

22nd (Thurs.). Annual General Meeting of the Essex Veterinary Society at the Saracen's Head Hotel, Chelmsford, 7.30 p.m.

Annual General Meeting of the Midland Counties Veterinary Association at the Birmingham Medical Institute, 36, Harborne Road, Birmingham, 15, 2.30 p.m.

June

12th (Thurs.). Annual Meeting of the R.A.V.C. Golfing Society at the North Hants Golf Club, Fleet, 10 a.m.

20th (Fri.). Meeting of the Society for the Study of Animal Breeding at Lyndhurst, Hants.

July

9th, 10th and 11th (Wed., Thurs. and Fri.). B.V.A. Committee and Council Meetings in London.

September

21st to 26th (Official Opening, Monday, September 22nd). 76th Annual Congress of the British Veterinary Association in Douglas, Isle of Man.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Devon. Pal-Park, Landkey, Barnstaple (Apr. 23).
Hants. Field Farm, Allotment Lane, Niton, Ventnor, Isle of Wight (Apr. 19).
Salop. The Hollins, Merrington Green, Bomere Heath, Shrewsbury (Apr. 22).
Somerset. Home Farm, Lydford-on-Foss, Somerton (Apr. 21).

Fowl Pest

Essex. Green Meadow Farm, Thorpe Road, Gt. Clacton, Clacton-on-Sea (Apr. 21).
Lancs. Longton Heys Field, Liverpool Road, Longton, Preston; Inskip Lodge, Inskip, Preston (Apr. 19).
Surrey. 3, Croydon Lane, Banstead (Apr. 23).
Sussex. Lattice Windows, Horam (Apr. 22); Great Easterfields, Horam (Apr. 23).

Swine Fever

Beds. 213, Castle Hill Road, Totternhoe, Dunstable (Apr. 18).
Berks. Tintagel, Sandhurst Road, Wokingham (Apr. 23).
Ches. Glebe Farm, Astbury, Congleton (Apr. 22).
Denbigh. Fernleigh, Chester Road, Wrexham (Apr. 24).
Dorset. Pine Farm, Old Wareham Road, Oakdale, Poole (Apr. 22).
Gloucs. Crossley Farm, Hanham, Kingswood, Bristol (Apr. 18); Piggeries, Lower Grove Road, Fishponds, Bristol (Apr. 23).
Herts. Oakleigh Farm, Codicote Road, Welwyn (Apr. 18).
Leics. Welby Grange, Welby, Melton Mowbray; Poplar Farm, Bagworth (Apr. 18); The Grange, Coventry Road, Sharnford, Hinckley; Hall Grip, Seine Lane, Enderby; Lodge Farm, Cossington (Apr. 21); 249, Derby Road, Loughborough (Apr. 22).
Mon. Green Court Farm, Bettws, Newport (Apr. 24).
Norfolk. Chapel Farm, Tuttington, Norwich (Apr. 22).
Somerset. Slade Farm, Tarnock, Axbridge (Apr. 18).
Warwicks. Alma Croft Farm, High Street, Shirley, Solihull (Apr. 21); Crick Lodge, Crick, Rugby (Apr. 24).
Wilts. Shop Field Buildings, All Cannings, Devizes (Apr. 21).
Worcs. New Loughborough Farm, Bretforton, Evesham; Middlebean Hall Farm, Bradley Green, Redditch (Apr. 22).
Yorks. Aldely, Off Scrooby Road,, Harworth, Doncaster (Apr. 21).

REFUGEE SCIENTISTS

The number of east German scientists and other intellectuals fleeing to west Berlin or west Germany has steadily increased in past weeks. They have included more than 60 university scientists, including nine professors, who have fled to west Berlin alone since January 1st, 1958. Among the latest to come over was Dr. Giffey, assistant of the veterinary faculty of east Berlin University.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Founding of The Veterinary College, London

Sir,—I read with great interest and pleasure, in your issue of April 19th, Professor Pugh's account of the part played by Thomas Burgess, D.D., F.R.S., in the formation of The Veterinary College, London.

Arising from that account, I would like to correct an impression conveyed by Sir Frederick Smith in "The Early History of Veterinary Literature," vol. 2, 1930, page 203.

When examining St. Bel's suitability for the position of first Professor of The Veterinary College, London, Sir Frederick Smith says that it was incomprehensible to him that, although William Moorcroft was in London at the time, his name was never mentioned in connexion with this appointment.

According to Professor Pugh's account, it was on February 18th, 1791, that the London Committee of the Odiham Agricultural Society decided that, from then on, they would be called The Veterinary College, London; St. Bel was thereupon appointed Professor to the College.

It is interesting to read that the Odiham Society's original intentions of sending two or more boys to be educated at the Veterinary School near Paris were frustrated by the outbreak of the French Revolution when we know that this upheaval did not prevent Moorcroft from proceeding to the Lyons School in March, 1790.

Sir Frederick Smith records in vol. 3 of his History that Moorcroft studied in France until March, 1791, and we know, therefore, that he was still at the Lyons Veterinary School at the time of St. Bel's appointment.

Moorcroft's movements after he left Lyons and before he set up in London are not at present fully documented. What he was doing between March and September, 1791, does not appear to be recorded: by his own account he was in Ormskirk, Lancashire, during September, 1791, after which he spent the next five months on the Continent. We know that he was in Half-Moon Street, Piccadilly, on March 30th, 1792, for he submitted to Dr. Simmons, on that date and from that address, an account of the removal of a hydatid cyst from the brain of a cow: this account was published in "Medical Facts and Observations," vol. 3, 1792. Moorcroft started his practice in London in the spring of that year, but whether he practised from Half-Moon Street before moving to 224, Oxford Street, is not at present clear.

It is evident, therefore, that Moorcroft was not in London nor was he available when the decision was taken to appoint St. Bel to the professorship of the College.

XUM

My reading of the events of this period leads me to believe that Granville Penn would not have been prepared to consider anyone but St. Bel for this position. After all, the London Committee decided at that eventful meeting in February, 1791, that the plans of the Odiham Agricultural Society and those of St. Bel should be consolidated and we know that St. Bel's original plan had been redrafted by Granville Penn himself.

I believe that Sir Frederick Smith would have liked to have established that John Hunter had helped to initiate the formation of the College. Moorcroft had been advised by Hunter to forsake his original profession and study veterinary surgery but there is no recorded evidence that Hunter and Moorcroft had any other contact than this.

Unless further evidence comes to light, we must, I think, accept that John Hunter's first real connexion with the infant veterinary profession was his appointment in April, 1791, as a Vice-President of The Veterinary College, and that Moorcroft was not considered as a possible Principal of the College until after the death of St. Bel in 1793.

Yours faithfully,
J. W. BARBER-LOMAX.

Roughwood House,
Chorleywood,
Herts.
April 25th, 1958.

A Scale of Veterinary Fees

Sir,—Periodically, there appears in THE VETERINARY RECORD an appeal from some veterinary surgeon or another for a standardised scale of fees for drugs and services to apply throughout the country. Very often a surgeon starting a new practice is in a difficult position, not wanting to undercut, or charge more, than neighbouring practitioners.

However, nothing has ever been done on a nation-wide basis because of the strong argument that conditions vary in different parts of the country. I feel that the time is now ripe for this state of affairs to be remedied.

Granting that town and country practices differ in their charges for small-animal work, and that veterinary surgeons will charge different fees in Berkshire than in Cornwall, I feel sure that a workable scale of fees could be devised to be used in conjunction with the type and geographical position of practices.

I am willing to initiate such a scheme, and this is how I think it should run:—

1. A detachable questionnaire to be inserted in the SUPPLEMENT to THE VETERINARY RECORD.
2. This questionnaire to be completed and returned to a central office for analysis. (There would be no need for veterinary surgeons to reveal their names, as long as the county and type of practice were stated.)
3. A scale of charges, maximum, minimum, and average would then be drawn up for each area and type of practice, and could be published in the SUPPLEMENT.

I feel sure that great interest would be shown in such a scheme and that it would be both informative and useful to every general practitioner. I am quite prepared to draw up a very full and comprehensive questionnaire and to analyse and collate the results if the B.V.A. would be responsible for their distribution.

Yours faithfully,
V. A. HARRISON.

Derwent,
Church Street,
Matlock.
April 24th, 1958.

The B.R.X. Club

Sir,—At annual dinners of the B.R.X. Club, an association of ex-students and staff of the Royal Veterinary College, messages of greeting are read from absent friends and members overseas. Short of replying individually it is difficult for us to express our appreciation of those wishes, and we would ask for the courtesy of your columns to inform members who wrote this year that their messages were received with gratitude and that the Club is sustained by their interest.

Yours faithfully,
C. W. OTTAWAY,
President.
A. S. KING,
Secretary.

B.R.X. Club.
April 24th, 1958.

ADVERTISER'S ANNOUNCEMENT

BURROUGHS WELLCOME & Co. announce that "Wellcome" brand Swine Erysipelas Vaccine (Living) is no longer available. An active immunity against Swine Erysipelas can be obtained by the use of "Wellcome" brand Swine Erysipelas Vaccine (A.T.) available in bottles of 10 c.c. and 30 c.c.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th April, 1958		3	1	8	28	—	43
Corresponding period in	1957	31	—	—	18	—	29
	1956	70	—	—	22	—	30
	1955	44	—	—	28	—	98
1st January to 15th April, 1958		55	3	108	223	—	311
Corresponding period in	1957	164	2	15	269	—	242
	1956	892	3	8	193	—	183
	1955	311	—	6	194	—	410